Fertiliser box

Contents

1 Fertiliser spreading is precision work

These days, the quality of spreading technology has reached a high standard.

And now, contrary to what was the previously common standard spreading widths of 12–15 m, the trend today is 24 m going towards 36 m.

Picture 1: ZA-TS/ZG-TS

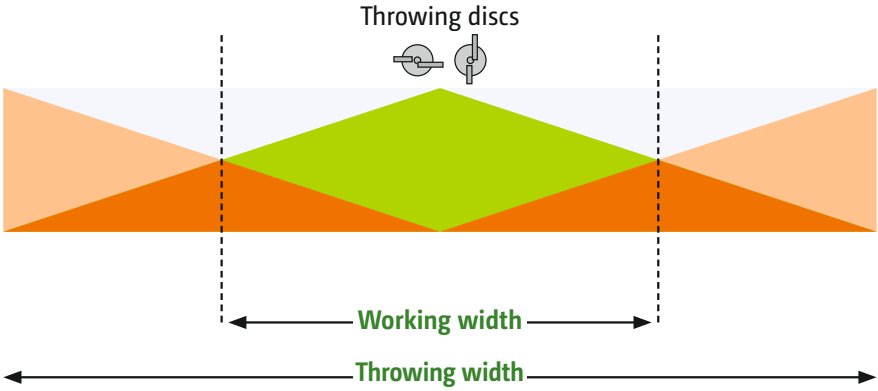
This places increasing demands on the technology of the spreader and the fertiliser quality.

One of the best preconditions for a good spreading performance is using fertilisers with a high bulk density, as products with a good specific weight achieve the desired throwing widths more easily.

Matched granule size distribution: This should be in a diameter range of 2.0 to 5.0 mm. Differently-sized granules are deposited more randomly behind the spreader. In this way the granular size range has a positive effect on the lateral distribution.

Nitrate containing fertilisers such as calcium ammonium nitrate, complete granulated NPK fertilisers or ammonium nitrate with sulphur offer these preconditions and can be spread more than 36 m. Specifically light fertilisers, such as, for example urea, are less well spreadable. Furthermore they have a fine uniform granule size which varies depending on the production site. The working width is limited and any side wind sensitivity is increased.

Picture 2: Optimum fertiliser distribution

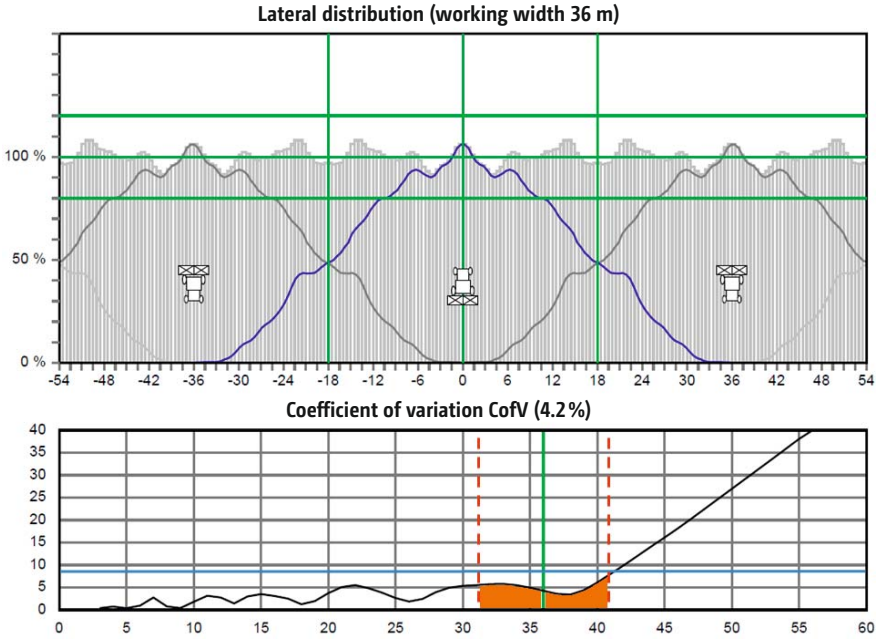


Good spread patterns are characterised by their shallow spreading flanks that offer large overlap zones. In this way a multiple overlapping is possible and any potential errors in distribution are extensively avoided.

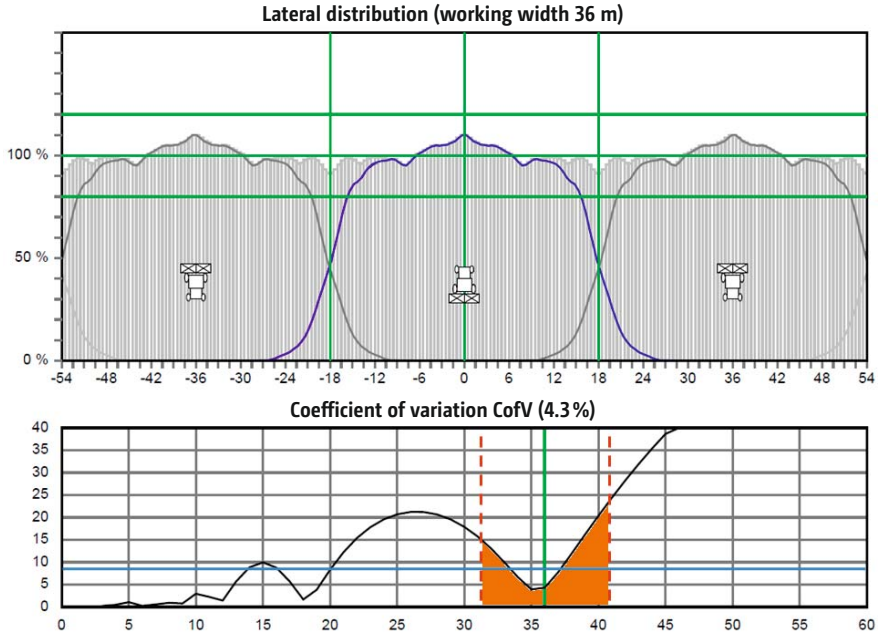
(effizientduengen.de)

Differing fertiliser qualities result in different spread patterns. Under optimum conditions an even distribution can be achieved both with triangular and trapezoidal spreading profiles. However, they are not similarly insensitive towards bout width deviations or wind conditions. Picture 3 shows a triangular profile whereas, Picture 4, a trapezoidal spreading profile and the relevant coefficients of variation (COV) as function of the working width.

Picture 3: triangular spread pattern



Picture 4: Trapezoidal spread pattern



- In the case of the triangular profile, the working width parameters for 36 metres were chosen. At this width, the coefficient of variation reaches a minimum. Even after deviations from the actual working width of +/- 5 metres the variation is not bigger than 8 %.

- In the case of the trapezoidal pattern, the working width was also set to 36 metres. However, the same track width deviation results in a considerably higher variation of more than 15 % up to 20 %.

So not just a high throwing width is sufficient to ensure good results. The spread pattern shape has a significant effect on the results. It depends on the adjustment of the spreader and from the physical properties of the fertiliser being spread. At identical working widths, fertilisers with a low bulk density tend to lead to trapezoidal spreading profiles whereas fertilisers with a high bulk density favour triangular profiles. Fertilisers with a high bulk density result in less spreading errors and thus in a better spread pattern.

DLG evaluation scale: lateral distribution on fertiliser spreaders

Coefficient of variation	Evaluation
< 5 %	Very good
5 – 10 %	Good
10 – 15 %	Satisfactory
> 15 %	Unsatisfactory

All the results in the AMAZONE setting charts and other AMAZONE setting recommendations are based on a spreading test with a coefficient of variation of less than 8 %.

2 Influencing variables on the spreading performance with centrifugal broadcasters

Many different factors may have an influence on the spreading performance. Therefore, it is essential to know what they are. In this way you then can match all influencing variables as best as possible to each other to ensure the optimum lateral distribution of the fertiliser.

2.1 Physical material data of the fertiliser

- Surface finish
- Average granule diameter
- Granule size distribution
- Flow characteristics
- Moisture content
- Bulk density
- Granule hardness
- Granule shape (c_w value)

This information is available from the fertiliser manufacturer/distributor or via a laboratory analysis

2.2 Hitch geometry of the fertiliser spreader

- Mounting height
- Mounting angle

All the important information regarding the mounting and operation of the fertiliser spreader can be obtained from the setting chart/operator manual

2.3 Design criteria of the fertiliser spreader

- Hopper shape
- Agitator
- Outlet aperture
- Angle of the spreading vane
- Length of the spreading vane
- Inclination of the spreading vane
- Feed-on point of the fertiliser
- Speed of the spreading disc

The AMAZONE setting chart refers to all influencing variables and provides you with the most suitable setting recommendations for your fertiliser. If you know the material data of your fertiliser and so adjust the spreader accordingly to that material then nothing should hinder a precise application.

3 AMAZONE FertiliserService

As one of the biggest manufacturers of fertiliser spreaders in Europe, AMAZONEN-WERKE constantly endeavour to provide the farmer with highly precise machinery for the best possible operational results and which takes into consideration any environmental impact. Since the end of 2009, a new fertiliser spreading test hall is available for research and development. Basic tests with the most different issues are continually carried out here. The evaluation is carried out via computer aided simulation. With the aid of these spread tests, here also the values for the setting chart are determined.

Picture 5: AMAZONE FertiliserService

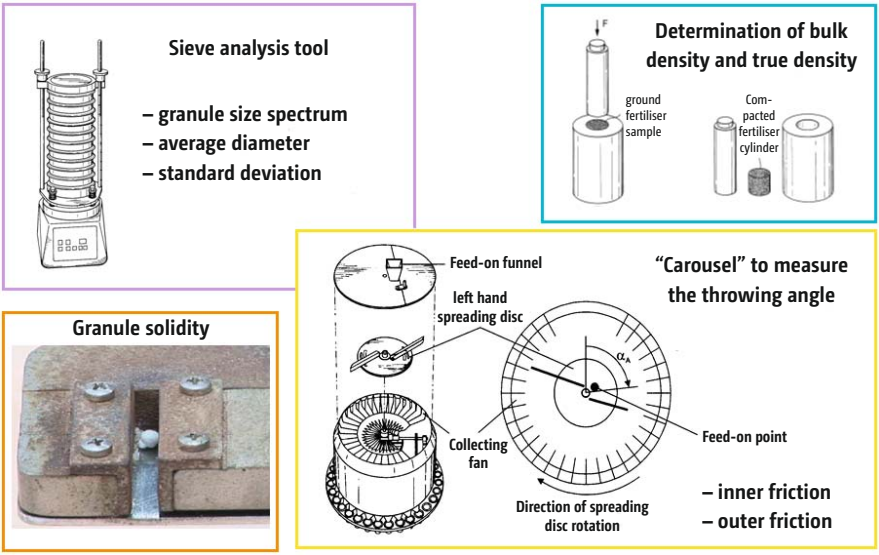
You can reach our FertiliserService from Monday to Friday from 8.00 a.m. until 15.00 p.m. by ringing the phone number 0049 (0)5405 501 111 or by fax on 501-374.

In addition, during the spring season, the FertiliserService is available for you across an extended service time.

3.1 Laboratory Test

For difficult fertiliser queries, users of an AMAZONE fertiliser spreader can make use of our phone service. In most cases the fertiliser database has got the most suitable setting values. If the relevant fertiliser is not included in the database, a fee-based laboratory test based on a 5 kg sample may provide the correct setting.

Picture 6: FertiliserService laboratory test

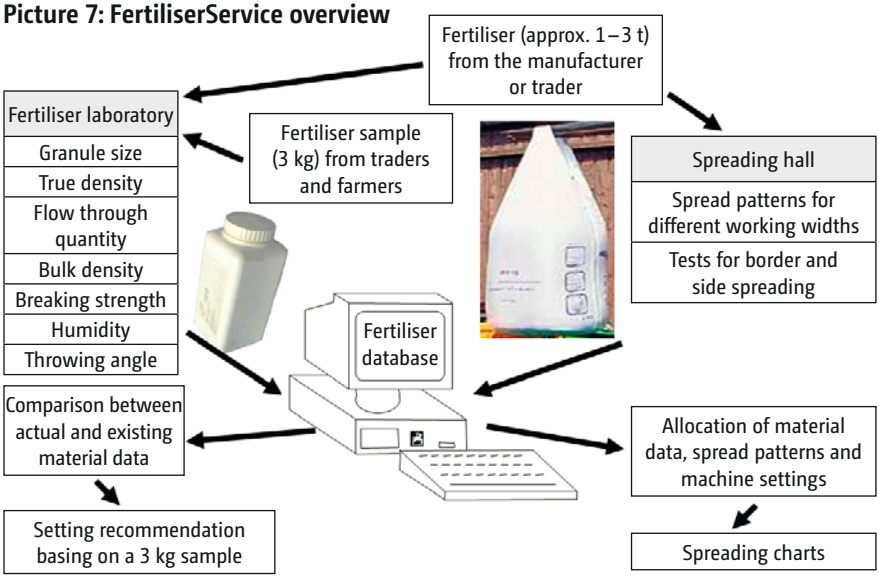


Please find the service card for the laboratory analysis of a fertiliser sample in the appendix on page 57.

3.2 Fertiliser database

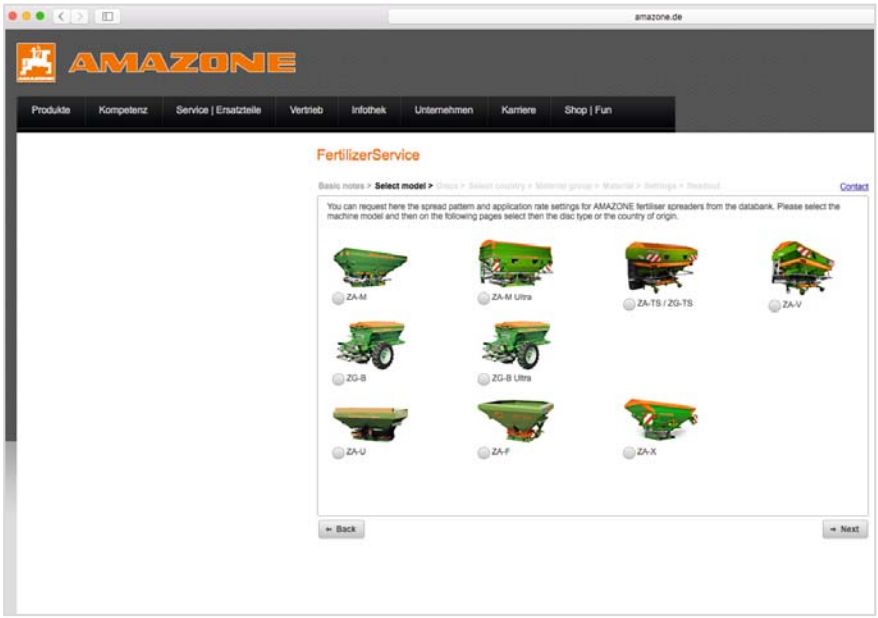
During operation of high-tech centrifugal broadcasters, it is important for farmers and agricultural contractors to have access to an optimum machine setting after providing the precise information. Therefore, comprehensive setting charts, easy-to-handle testing and calibration devices as well as the FertiliserService by phone are a matter of course at AMAZONE.

Picture 7: FertiliserService overview



Any user of AMAZONE fertiliser spreaders can query, via the internet, the machine settings in relation to machine model, working width and fertiliser type, whereby the web-server accesses to an existing database. The benefits of this easy to handle on-line query are in particular that new test results and fertiliser types can be taken into consideration immediately.

Picture 8: FertiliserService Online query

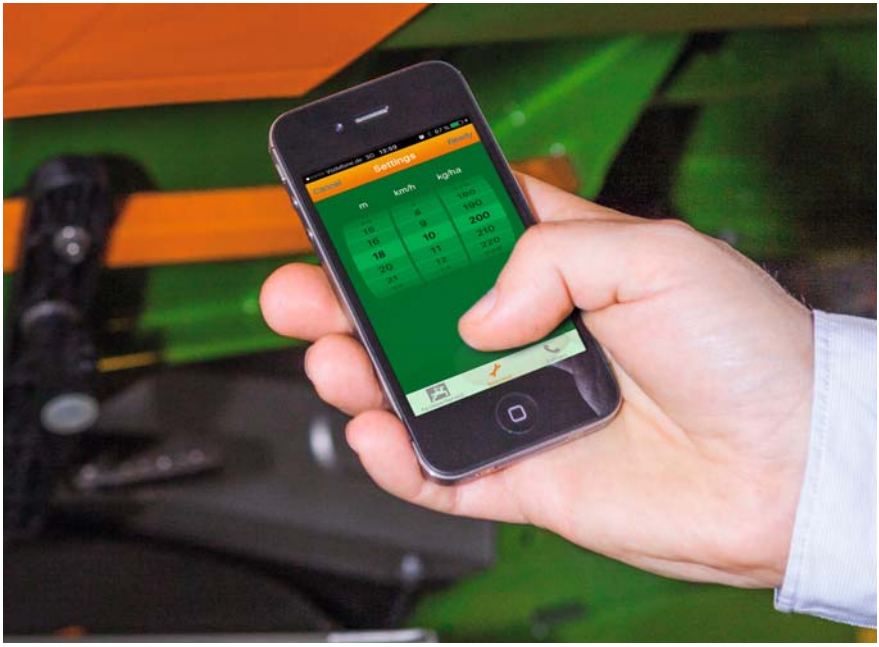


In addition, the farmer/agricultural contractor can check at any time whether his spreading chart is still up to date.

3.3 FertiliserService App

With the free of charge App for smartphones, the precise setting values, depending on machine model, working width, fertiliser type and application rate can be queried at any time.

Picture 9: FertiliserService via Smartphone



Download now the free of charge, detailed FertiliserService setting chart App for your AMAZONE fertiliser spreader. Then the setting values for your spreader will be available off-line for your specific implement and can be synchronised constantly when on-line. You select the relevant searched for fertiliser from a list, enter the application rate, the speed and the working width and you will receive the necessary setting values for your spreader. With an on-line connection, a picture of the relevant fertiliser can also be recalled.

Currently the App is available for the following gadgets:

- Apple iPhone, iPad and iPod touch
- Android Smartphones

Picture 10: FertiliserService App

3.4 The most up-to-date spreading hall in the world

With the fertiliser spreading test hall for research, development and series support, the latest technology for testing spreaders with fertiliser and other spreading materials is now available at AMAZONE. In this way AMAZONE offers to its customers the most up-to-date FertiliserService in the world.

Picture 11: AMAZONE test hall

During the course of a complete upgrade to the inside of the existing test hall, a newly designed testing device with innovative measuring and evaluation technology included was installed and which resulted in a great number of decisive

improvements. So, now, for instance, fertiliser spreaders up to a working width of 72 m can be tested, new fertiliser types can be evaluated quicker still in relation to their material and spreading properties and the relevant setting recommendations for AMAZONE fertiliser spreaders can be updated at short notice. When you enter the new test hall, the first thing you notice is a hydraulically-driven rotating and lifting platform equipped with weigh cells. Here, two fertiliser spreaders can be fitted simultaneously. Along the central longitudinal axis, starting at the platform, a 42 m measuring bar with 84 collection funnels, each of a size of 50 x 50 cm, is installed. Each funnel leads to a measuring bucket which is mounted on to an online weigh cell.

When a spreading test is carried out, the fertiliser spreader, mounted to the lift frame, rotates at a defined distance and speed around a vertical axis and spreads the pre-set fertiliser rate. In parallel, the 84 on-line weigh cells each register the collected fertiliser rates at a frequency of 5 measurements per second. So, during one test run, ten of thousands of exact weight measurings are carried out which then, with the aid of specific computer simulation programmes are converted into the relevant spread patterns. Thanks to the new on-line weigh cell technology, it is now possible to analyse the spreading tests, not only with regard to their lateral distribution, but also regarding their spatial distribution. This results in decisive benefits, especially for the development of new fertiliser spreaders and added technology, such as, for instance the automatic part-width section control (GPS-Switch).

In addition to the quicker and more precise results, further improvements result. As two fertiliser spreaders can be simultaneously mounted to the rotating lift platform, the set-up times are reduced. So, whilst the evaluation of a test from spreader 1 is being carried out, a new test with spreader 2 can already be in action. With this in mind, and due to the further innovations, the test capacity noticeably increased: from previously an average of 12 up to now 100 tests/day.

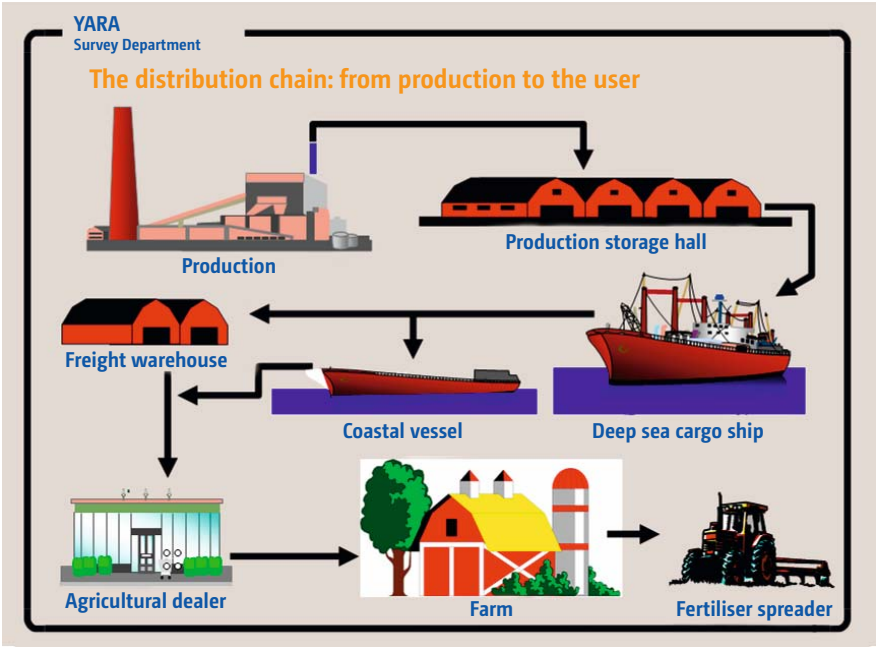
Advantages also result from the reduction in the environmental impact and use of resources: The energy demand for dehumidification and air conditioning in the hall has now been reduced by 40 %. The new floor and the central underfloor conveyor belt provide more flexibility and speed when cleaning the hall. The fertiliser can be gently collected and is made available in a good quality to regional farmers for application.

For the practical application of AMAZONE fertiliser spreaders, it is decisive that the FertiliserService from AMAZONE provides information for economical and, at the same time, environmentally-friendly utilisation of the fertiliser. For more than 25 years, many types of fertiliser from Germany and abroad have been tested and all the relevant data determined in the AMAZONE spreading hall has been registered in a database.

4 The correct storage/handling and transport of fertilisers

In the course of time the physical material properties of the fertiliser can significantly change via repeated handling, transport and due to the storage conditions (see picture 12).

Picture 12: The route of the fertiliser: from production to farmer



During storage and when handling fertilisers it is important to note the following items (next page).

Fertilisers react sensitively to environmental influences. The natural enemy of the fertiliser during transport and storage is humidity of any kind. This means that, during transport and storage, bulk stored fertilisers must be protected from dampness and moisture, including also air humidity.

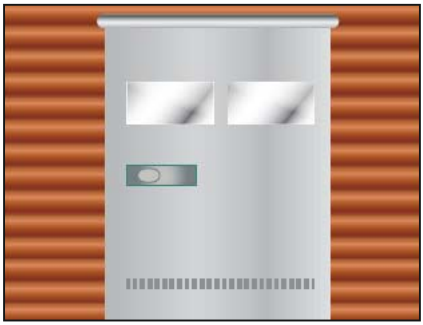
- Unload bulk fertilisers only in dry weather conditions.
- Transport vehicles must be dry and clean.
- Use storage implements which cause as little abrasion as possible.
- The storage shed must be clean, dry and weatherproof.
- Immediately after having finished storing, cover the surface of the fertiliser pile with tarpaulins and safeguard the sheets from shifting by weighing down or anchoring.
- Also during a break in spreading of more than one day, the surface of the fertiliser pile must be temporarily covered.
- During loading and unloading the storage hall and the surrounding work area must be clean and the driving area free from fertiliser.
- During unloading with a front end loader, ensure that the shovel is in the correct angle towards the ground, that means it should not be too flat on the surface to avoid any grinding of the fertiliser granules.
- Keep windows and doors closed and only open if necessary. Avoid any draughts in the hall.
- Note the compatibility of fertilisers. Do not store incompatible fertilisers (for instance urea/CAN) side by side.
- Observe the legal regulations, especially those for the storage of ammonium nitrate fertilisers.

If the above mentioned items for the transport and storage are carefully observed, the quality of the fertiliser, which means granule hardness, flowability and good spreading properties are maintained.

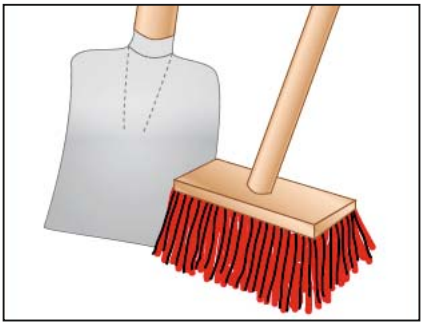
Good storage is the cornerstone for perfect nutrient distribution and utilisation.

(effizientduengen.de)

Picture 13: The correct storage of fertiliser

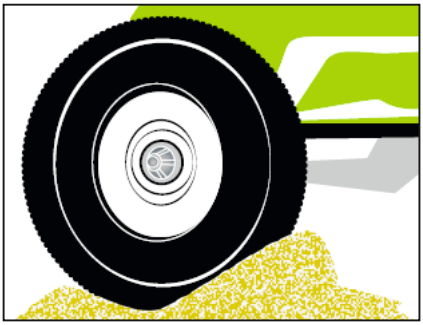


1. Keep doors closed

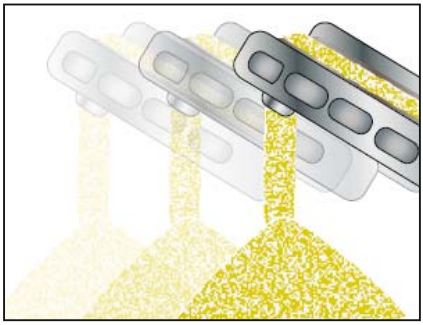


2. Keep the floor dry and clean

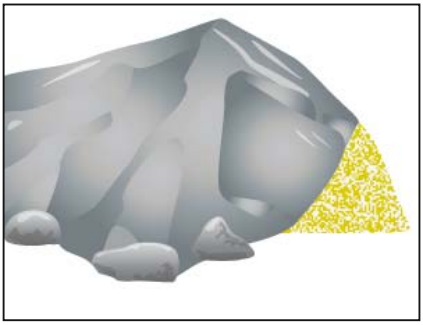
3. Do not overload conveying implements to keep transport routes clean



4. Do not drive into the fertiliser



5. Shift the storage point several times to avoid demixing

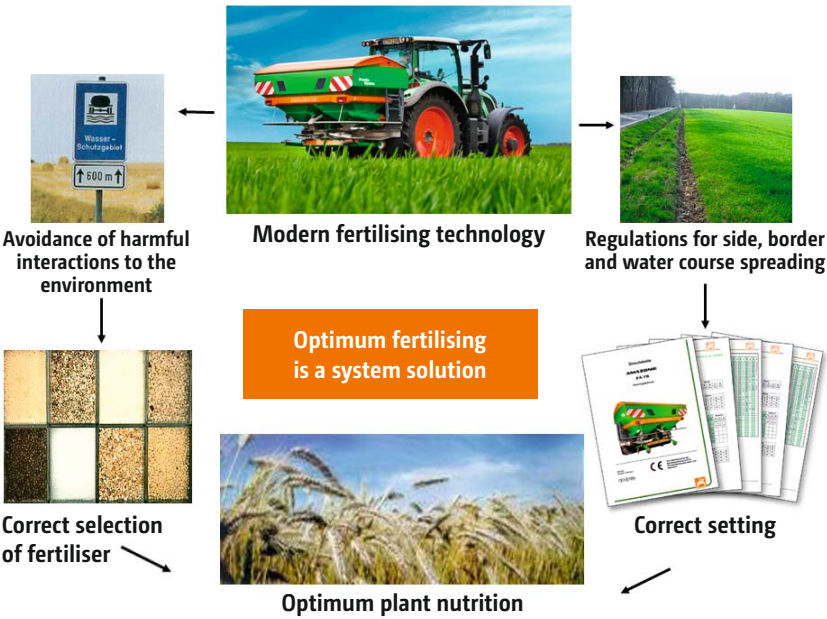


6. Cover fertiliser piles immediately and, for emptying, only open as far as necessary and close afterwards

5 Optimum fertilisation is a system solution!

To ensure good plant nutrition during mineral fertiliser application, the optimum team work of several factors is essential. The way that the fertiliser is applied is a key issue because the spreader has to optimally distribute the selected/available fertiliser in the field recognising any environmental and distance-related regulations with regard to field borders and water courses. An exact and even fertiliser distribution around the field's border is especially in the focus.

Picture 14: Optimum fertilisation



5.1 Correct choice of fertiliser

More than 600 different fertilisers exist, with a vast array of different nutrient combinations, shapes, sizes and spreading properties to ensure the optimum supply of the plant with the required nutrients.

Picture 15: Types of fertiliser

As every fertiliser features different flow and flight characteristics, it is especially important to know the spreading properties to ensure an exact distribution

5.2 Regulations for border spreading from the fertiliser legislation (valid since 2006)

3 m distance towards the field's border

As a matter of principle, a distance of 3 m away from any surface water has to be maintained if mineral fertiliser is to be spread without a approved border spreading device. Direct application and non-compliance with this distance means that an offence has been committed.

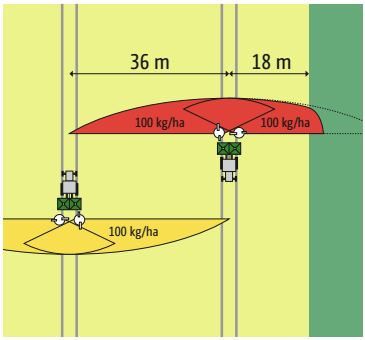
1 m distance to the field's borders where there is surface water (water course spreading)

For spreading fertilisers alongside surface water, a minimum distance of 1 m is prescribed when fertiliser spreaders with an approved border spreading device according to EN 13739-1 and -2 are utilised.

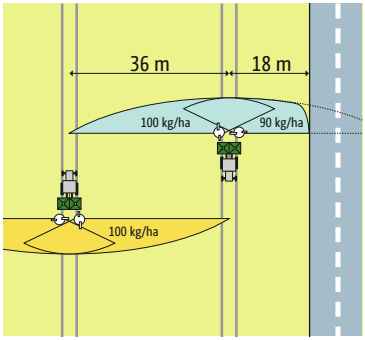
No distance towards the field's border (border spreading)

For spreading fertilisers along the field's border, no distance is prescribed when fertiliser spreaders with an approved border spreading device according to EN 13739-1 and 13739-2 is being utilised.

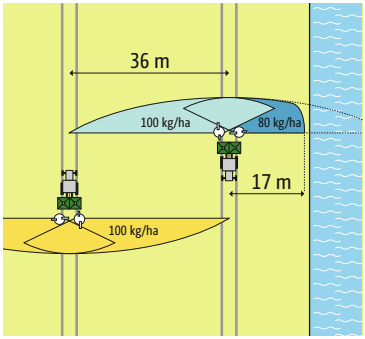
Picture 16: Side, border and water course spreading



Side spreading (yield oriented setting). The adjacent field is an agriculturally used area. Here it can be tolerated that a slight amount of fertiliser is thrown beyond the field's border. The fertiliser distribution inside the field also at the field's side is still 100 % of the desired quantity.



Border spreading (environmentally oriented setting). If the field is next to a road or a cycle path, no fertiliser may be thrown beyond the field's border. To avoid an over-fertilisation inside the field, the border side spread rate has to be reduced resulting in a slight under-fertilisation at the field's border. The border spreading procedure corresponds to the requirements of the fertiliser legislation.



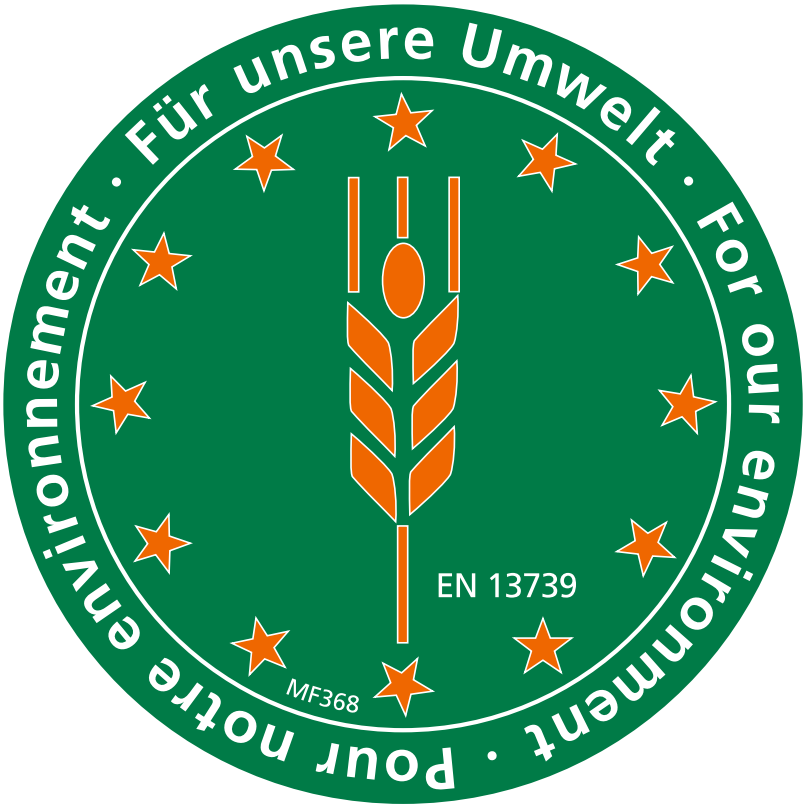
Water course spreading (environmentally oriented setting). If any surface water is adjacent to the field's side the fertiliser legislation prescribes to maintain a distance of one metre when using a border spreading device or, without a border spreading device up to three metres. To avoid under-fertilisation inside the field, the spread rate has to be reduced at the border.

5.3 AMAZONE border spreading devices

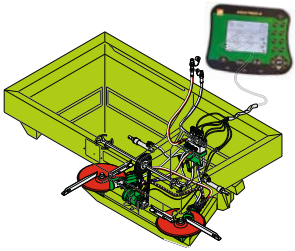
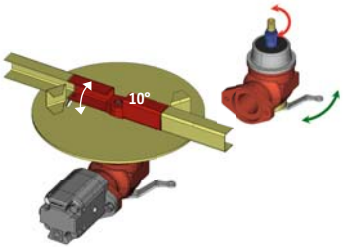
All AMAZONE border spreading devices (the border spreading vanes, discs, deflectors, the Limiter and the hydraulic spreading disc drives) fulfil the EN Standard 13739-1 and 13739 -2 and are, according to the fertiliser regulations, usable without any limitations.

Only at AMAZONE will you find in the spreading charts settings for side, border and water course spreading.

Picture 17: EN13739



Picture 18: AMAZONE border spreading devices

	**TeleQuick** border spreading vane (ZA-X)
	**TeleSet** border spreading disc (ZA-M/ZA-U)
	**Limiter** (ZA-X/ZA-M/ZA-M Ultra/ZA-V/ZG-B)
	**Hydro** drive (ZA-M/ZA-M Ultra/ZG-B)
	**TS** spreading system (ZA-TS/ZG-TS)

5.4 AMAZONE spreading charts

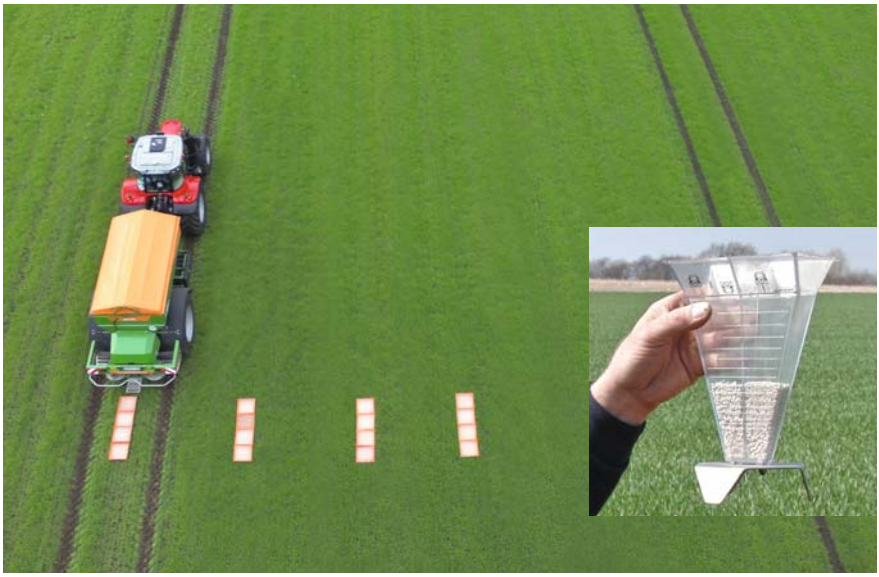
All the settings for AMAZONE centrifugal broadcasters are carried out according to the spreading chart. All commercially-available types of fertiliser are spread in the AMAZONE spreading hall and the determined setting data entered into the spreading chart. The types of fertiliser mentioned in the spreading chart were in faultless condition when the setting data was determined.

Picture 19: AMAZONE setting charts

5.5 Mobile test kit

For the easy and quick check of the fertiliser lateral distribution AMAZONE offers the “Mobile test kit”.

Picture 20: Mobile test kit



With this kit you can check the lateral distribution again directly in the field. For this, 8 or 16 collecting trays and 1 or 2 measuring funnels are available which are placed according to the instructions. Each collecting tray is provided with a grid insert. After the placement of the collecting trays 2 or 3 tramlines are driven over. The lateral distribution determined via the “Mobile test kit” is evaluated either manually or with the aid of the test kit menu in the AMAZONE AMABUS or ISOBUS spreader software. If necessary, the software automatically suggests a correction of the spreader settings.

6 Detection and evaluation of spreading errors

A spreading error is indicated as a % deviation from the desired application rate across the entire working width:

- Up to 25 %: no noticeable stripes
- 25 – 30 %: slight colour differences in strips are visible
- 30 – 50 %: significant colour differences are visible

Picture 21: Significant spreading error in the crop

Results of spreading errors:

- Difficult crop management
- Different development of the crop
- Difficult harvest, especially with lodged crops
- Negative influence on yield and quality

Picture 22: Lodged crop due to wrong spreader setting/poor fertiliser quality

Reasons for spreading errors:

- Incorrect machine settings (mounting height, mounting angle, vane position, disc speed, delivery system position)
- Worn spreading vanes
- Poor quality of the product spread (high dust content, poor granule hardness, light granules)
- Too high a wind speed during spreading

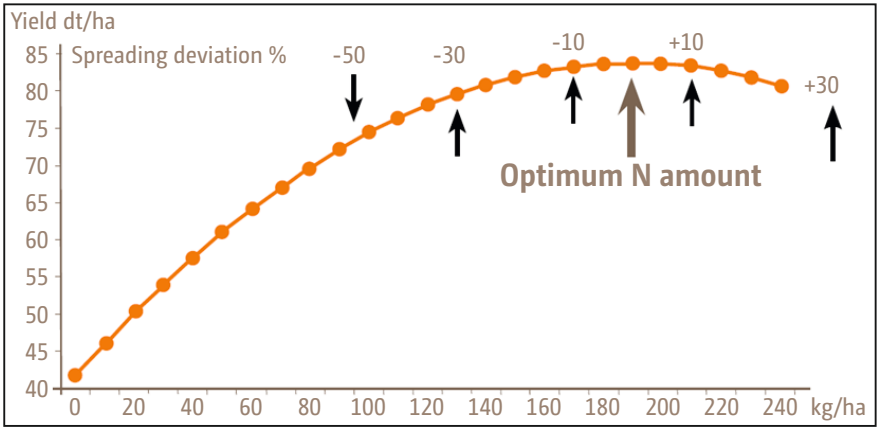
The following tables and pictures show the negative influence of such spreading errors on yield and thus on income.

Yield loss due to uneven nitrogen distribution

Winter wheat	Yield losses at a spreading deviation of				
crop type	... 15%	... 30%		... 50%	
		without lodged crops	with lodged crops	without lodged crops	with lodged crops
Winter wheat	0.6%	2.3%	22.4%	6.3%	31.3%
Winter barley	0.6%	2.2%	8.6%	6.2%	14.3%
Spring barley	0.7%	2.9%	10.8%	6.1%	17.8%
Winter rye	0.7%	2.7%	18.2%	7.6%	25.9%
Winter rape	0.9%	3.6%		10.0%	

(according to Zimmermann)

Picture 23: Results on yield at different spreading deviations



Basis: 28 tests Limburgerhof, 1986–1998

Relative yield losses and losses of income at different yield levels in relation to spreading errors in winter wheat

Winter wheat	Yield and income losses at a spreading deviation of ...				
loss of income at ...	... 15 %	... 30 %		... 50 %	
		without lodged crops	with lodged crops	without lodged crops	with lodged crops
Relative yield loss:	**0.6 %**	**2.3 %**	**22.4 %**	**6.3 %**	**31.3 %**
... 7 t/ha	6 €/ha	24 €/ha	235 €/ha	66 €/ha	329 €/ha
... 0 t/ha	7 €/ha	28 €/ha	269 €/ha	76 €/ha	376 €/ha
... 9 t/ha	8 €/ha	31 €/ha	302 €/ha	85 €/ha	423 €/ha
... 10 t/ha	9 €/ha	35 €/ha	336 €/ha	95 €/ha	470 €/ha

Assumed wheat price 150 €/t

(effizientduengen.de)

If spreading errors in the crop are visible with the naked eye, one can assume here a spreading error of at least 25 %. That means, the coefficient of variation of the lateral distribution is “inadequate” according to the DLG evaluation table. Such major deviations in fertiliser distribution can, depending on the crop, result in significant yield losses. The situation is especially severe when the bad spreading quality results in lodged crops.

7 Blended fertilisers and their pitfalls

In practice often mechanically blended complex fertilisers, so-called “Bulk blends” (a mixture of individual fertilisers with different nutrient content and spreading behaviour) are offered. Here benefits are mostly emphasised, such as individual nutrient compositions and favourable nutrient prices compared with industrially produced complex fertilisers (every granule contains the same nutrient composition).

The potential disadvantages, such as poor spreading properties and missing transparency with regard to the components used, are hardly considered. Because the quality and spreading ability of the blended fertilisers heavily depends on the base products and their similarity in physical properties.

Important parameters of solid fertilisers

Product	Bulk density (kg/l)	Granule hardness (N)	Granule diameter (mm)
KAS granular	0.97–1.10	50–100	3.2–3.9
NPK granular	1.11–1.17	60–120	3.2–3.9
ASS granular	0.97	50–100	3.0–3.6
Urea granular	0.80–0.85	20–40	3.0–3.3
Urea prilled	0.75–0.80	10–30	2.5–2.8

Picture 24: Blended fertilisers

The individual pictures of the blended fertilisers show that here fertiliser with radically-differing physical properties (large – small, coarse – smooth, round – square) have been blended together so that, especially at larger working widths, problems will be found in the lateral distribution.

Mechanically-blended fertilisers hide the following dangers:

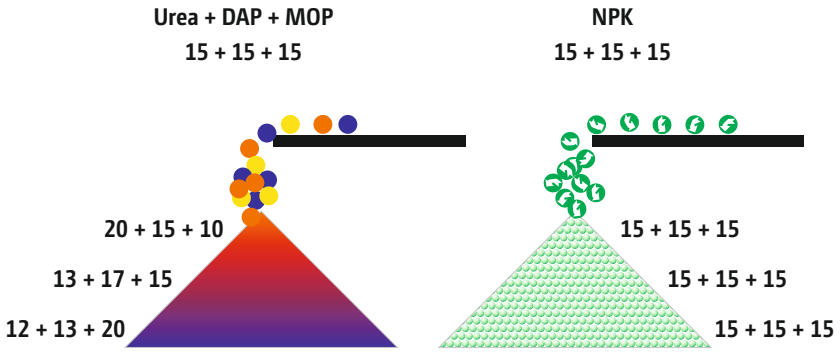
- Incompatibility of constituents
- Demixing during handling, transport, storage and application
- Poor nutrient distribution
- Uncertain effectiveness when using imprecise nutrient content blends

Demixing of blended fertilisers

A product, such as in picture 25, is subject to heavy demixing during handling. Even if the product is filled directly into the fertiliser spreader, a demixing effect results from the funnel shape and the movement of the entire machine. When the product runs short in the spreader hopper, the granules with the largest size increasingly get left behind.

Also when handling and storing blended products, a demixing takes place. The following pictures show this schematically.

Picture 25: Demixing of blended fertilisers



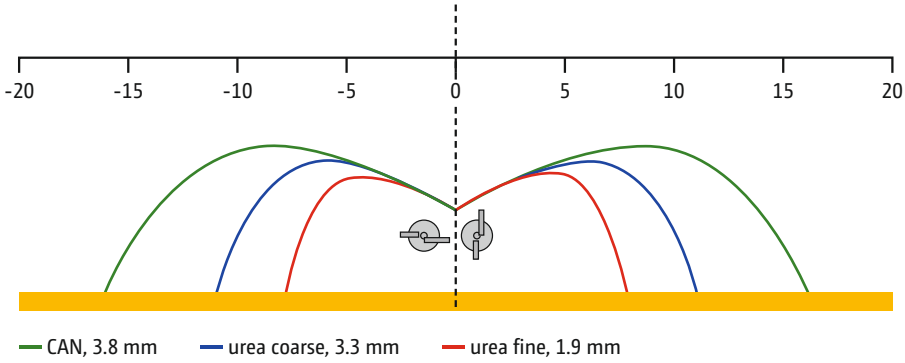
Demixing due to differing bulk densities and sizes of the blended components

(BASF)

Composite fertilisers offer the advantage that the complete fertiliser has been produced in one production facility under constant settings. Every fertiliser granule contains the same nutrient composition. The demixing of nutrients cannot take place here.

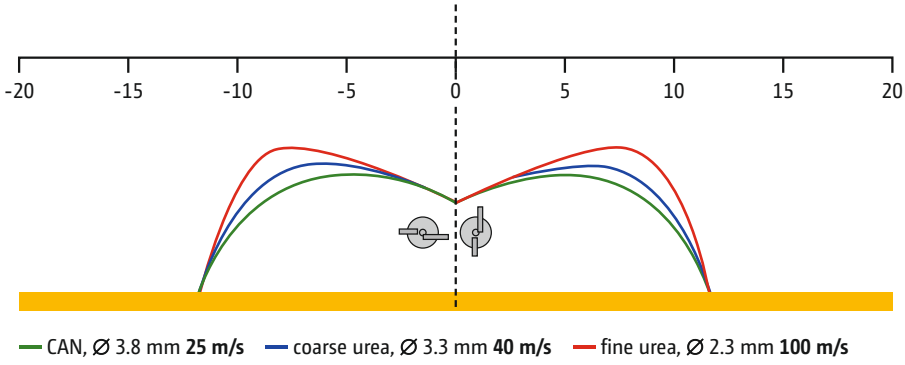
Spreading blended fertilisers leads to a demixing of the individual fertiliser granules with the relevant nutrients being segregated into a strip-wise distribution in the field.

Picture 26: Flight characteristics of individual fertilisers at the same spreader setting



For the optimum distribution of the different fertilisers it is recommended to spread every fertiliser individually with the relevant optimum settings. Only in this way can the optimum nutrient distribution be ensured.

Picture 27: Optimum spreader setting for different fertilisers



(effizientduengen.de)

8 Influencing factor of wind when fertiliser spreading

Modern fertiliser spreaders are able to optimally spread virtually any granule. End users know quite well that, for instance, wind can have a significant influence on the spreading quality. However, so far, the extent of wind influence has not been scientifically investigated. Regarding this problem, trials at the Advanced Technical College Mannheim (Prof. Rädle) have provided informative results.

With the aid of a mobile test rig, these differences between the fertiliser types have been further investigated.

For this, the experimental set-up is pretty simple: Similar to the checking of the distribution accuracy in practice, spreading trays are placed along the working width of the machine. The fertiliser spreader is set to three different fertilisers according to the setting chart. The measurement of any spreading errors is carried out in the wind by registering the placement of the granules within the spreading trays. At the same time the wind speed at the time of testing is registered. The working width for this test is 21 m.

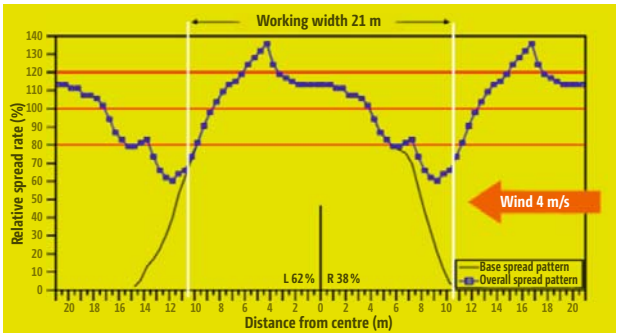
Wind susceptibility depends on the fertiliser

Picture 28 shows the result of these spreading tests for CAN and two qualities of urea. Hereby the black line illustrates the applied fertiliser rate in one pass, i.e. the base spread pattern.

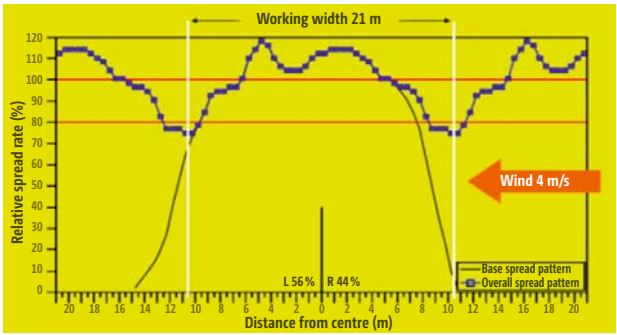
From the overlap created when driving back, an overall spread pattern results which is illustrated by the blue line.

The influence of a 4 m/s side wind from the right hand side shows here, with a fine urea, a significant shifting of the applied fertiliser rates towards the left hand working area. This results in a spreading error in the total pattern of 34.4 % with a fine-granulated urea. With CAN, and at the same wind speed, a very balanced (triangular) base spread pattern is still created so that the fertiliser distribution to both working areas is 50 % of the total rate. In the total spread pattern, the spreading error here is just 7 % and thus shows an optimum fertiliser distribution, meaning that no yield losses have occurred here.

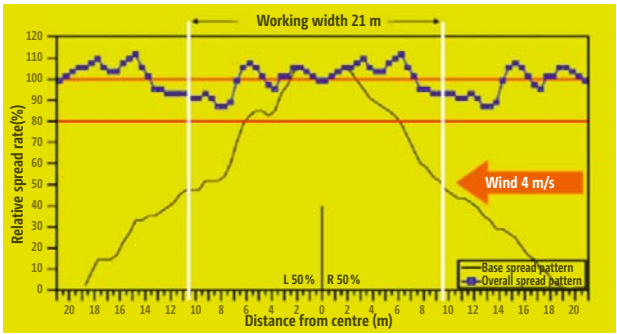
Picture 28: Wind susceptibility of individual fertilisers



Overall spread pattern with fine urea at wind of 4 m/s



Overall spread pattern with coarse urea at wind of 4 m/s



Overall spread pattern with CAN at a wind speed of 4 m/s

Result

Especially at the larger working widths, one can assume that each increase in the working width by a metre means that the wind influence makes spreading more critical.

Light granules, such as urea, are heavily affected by wind. Especially when large working widths have to be achieved they are, in addition, subject to higher mechanical loads. Thus, with urea, often the distribution accuracy suffers.

Furthermore, it becomes obvious that, for the application of crop protection agents, the rough rule of thumb for the maximum wind speed of 5 m/s can not be generally transferred to the spreading technology. CAN with a high specific individual weight shows at wind of 6–7 m/s still a stable spread pattern whereas lighter products such as urea show a high spreading error already at a wind speed of 4 m/s.

In this way, the spreading errors created may then result in yield losses.

(effizientduengen.de)

9 AMAZONE Fertiliser box

To illustrate, in a simple and clear way, the differences between the various fertilisers, AMAZONE has assembled a fertiliser box with 9 different fertilisers.

Picture 29: AMAZONE fertiliser box

50 grammes of each fertiliser are in the box.

The exact description, the average granule diameter and the bulk density are also noted.

Under the material test number the data file for the relevant spreading material is saved in the AMAZONE database (also see appendix).

In addition, for each fertiliser, the maximum achievable working width with the AMAZONE ZA-M, ZA-TS and ZA-V spreaders are indiated as well.

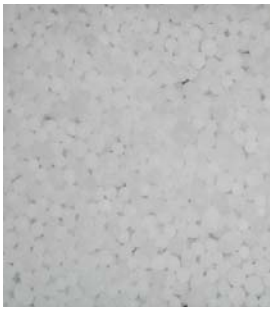
9.1 Contents of the fertiliser box

Urea 46 % N gran.
Material test: 83008747

Urea 46 % N gran.
Material test: 83009236

Urea 46 % N prilled.
Material test: 83008366

Urea
46 % N prilled.
Material test: 83007838



Potash
40 % rough ground
Material test: 83008454

Ammonium Nitrate
27 % N gran.
Material test: 83008609

Ammonium Sulphate
26 (+13 S) gran.
Material test: 83008357

Sulphate of Ammonia
21 % N gran.
Material test: 83008596

MgO fertiliser
25 % MgO (+20 % S)
Material test: 83009539

Urea 46 % N gran. Material test: 83008747 Ø grain diameter: 3.22 mm bulk density: 0.74 kg/l max. working width: ZA-M: 30 m ZA-TS: 36 m ZA-V: 36 m	**Urea 46 % N gran.** Material test: 83009236 Ø grain diameter: 3.83 mm bulk density: 0,77 kg/l max. working width: ZA-M: 30 m ZA-TS: 45 m ZA-V: 32 m	**Urea 46 % N prilled** Material test: 83008366 Ø grain diameter: 2.03 mm bulk density: 0.76 kg/l max. working width: ZA-M: 24 m ZA-TS: 30 m ZA-V: 30 m
Urea **46 % N prilled** Material test: 83007838 Ø granule diameter: 2.84 mm bulk density: 0.73 kg/l max. working width: ZA-M: 28 m ZA-TS: 33 m ZA-V: 28 m	**Potash fertiliser** **40 % K** Material test: 83008454 Ø granule diameter: 4.02 mm bulk density: 1.17 kg/l max. working width: ZA-M: 36 m ZA-TS: 40 m ZA-V: 36 m	**Ammonium Nitrate** **27 % N gran.** Material test: 83008609 Ø granule diameter: 3.86 mm bulk density: 1.06 kg/l max. working width: ZA-M: 36 m ZA-TS: 54 m ZA-V: 36 m
Ammonium Sulphate **26 (+13 S) gran.** Material test: 83008357 Ø grain diameter: 3.86 mm bulk density: 0.95 kg/l max. working width: ZA-M: 36 m ZA-TS: 48 m ZA-V: 36 m	**Sulphate of Ammonia** **21 % N gran.** Material test: 83008596 Ø grain diameter: 2.43 mm bulk density: 1.03 kg/l max. working width: ZA-M: 32 m ZA-TS: 39 m ZA-V: 36 m	**MgO fertiliser 25 %** **MgO (+20 % S)** Material test: 83009539 Ø grain diameter: 3.93 mm bulk density: 1.31 kg/l max. working width: ZA-M: 36 m ZA-TS: 54 m ZA-V: 36 m

9.2 Explanation for the material test

Spreading material:	Exact name of the tested spreading material
Manufacturer:	Manufacturer of the tested material
Supplier:	Source of supply of the tested spreading material
Material-ID:	Internal identification number of the spreading material
Material test-ID:	Identification number of the material test
Test data:	Date when the material test was carried out
Person responsible:	Abbreviation of the employee who has carried out the material test
Granule diameter:	Average granule diameter of the fertiliser tested in mm
Standard deviation:	Average deviation of the granule diameter from the average granule diameter of the tested spreading material in mm
Compactness:	Not tested
Throwing angle:	The average throwing angle from the spreading disc of the tested spreading material in degrees
Standard deviation:	The average deviation of the throwing angle from the average throwing angle of the tested spreading material in degrees
Bulk density:	Density of the spreading material in bulk condition in kg/l
Density ratio:	Not tested
Granule hardness:	Breaking strength of the individual fertiliser grains in N

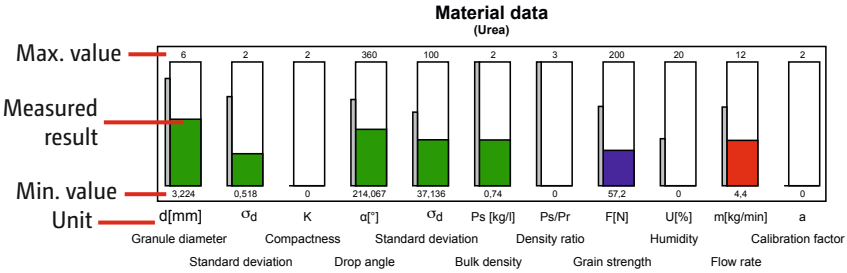
Humidity: Moisture content of the tested spreading material in %

Flow characteristics: Flow rate of the tested spreading material through a defined aperture in kg/min

Calibration factor: Not tested

With the aid of a bar chart, the measured results are indicated. Above every column the maximum value of the measuring range is indicated. Underneath every column the minimum value is indicated. The relevant unit of measurement is indicated underneath the column (see picture 30).

Picture 30: Explanation of material data



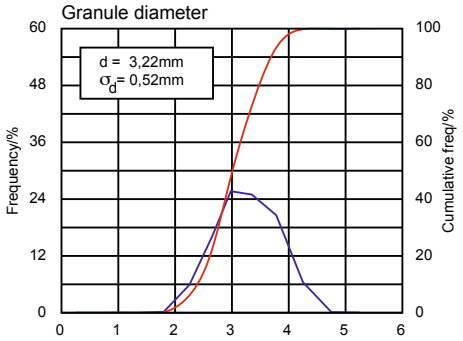
9.3 Material tests

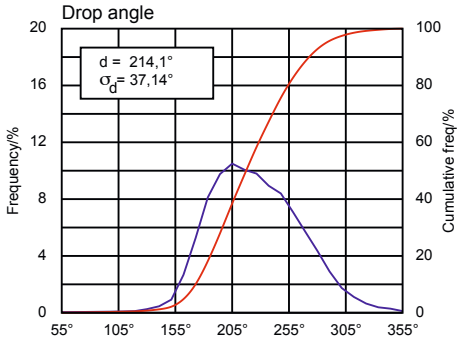
Material test 83008747

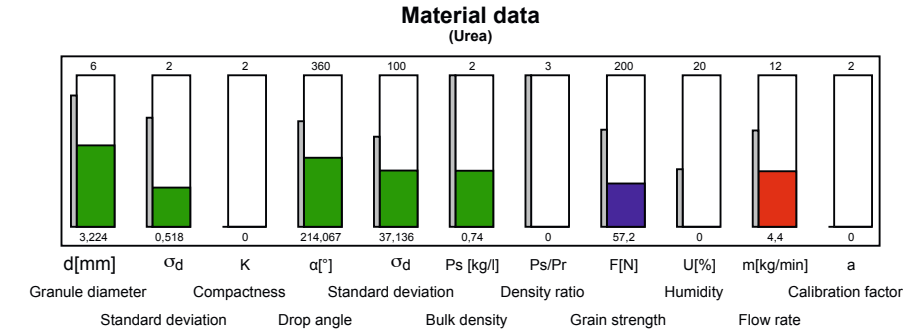
Material data sheet

Material	Harnstoff 46%N gran. SORFERT - Algerien
Manufacturer	SORFERT - ARZEW
Supplier	OCI Agro France S.A.S.
Comment	

Material ID	434004
Material test ID	83008747
Date of test	2013-12-12
Operator	fball





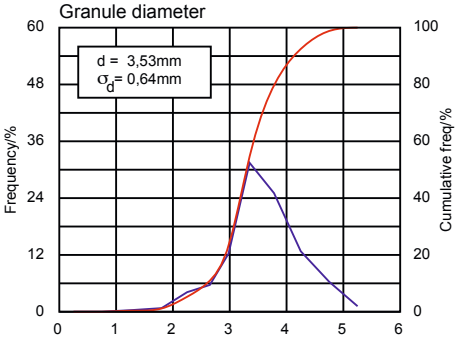


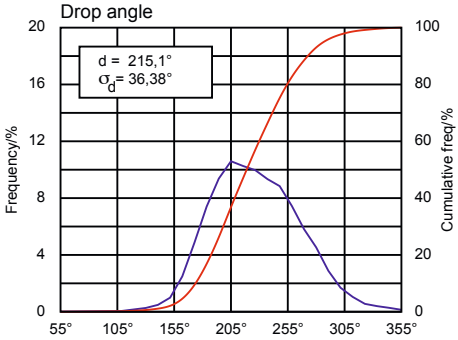
Material test 83009236

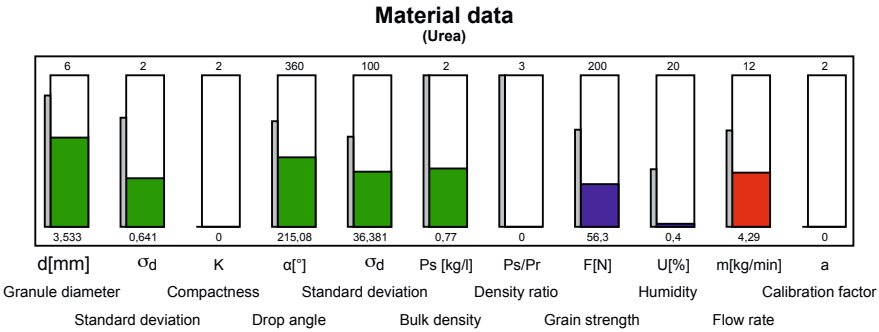
Material data sheet

Material	Piagran® 46 SKW Piesteritz
Manufacturer	SKW Stickstoffwerke Piesteritz GmbH
Supplier	Werner Wiemann GmbH
Comment	

Material ID	400416
Material test ID	83009236
Date of test	2014-02-14
Operator	fball





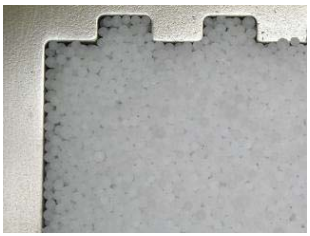


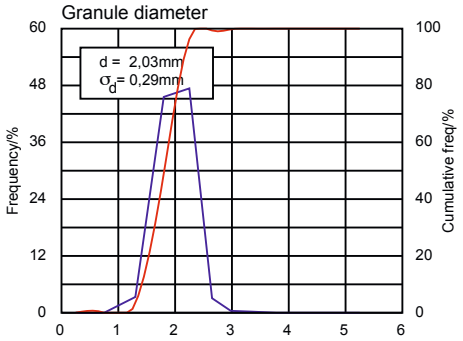
Material test 83008366

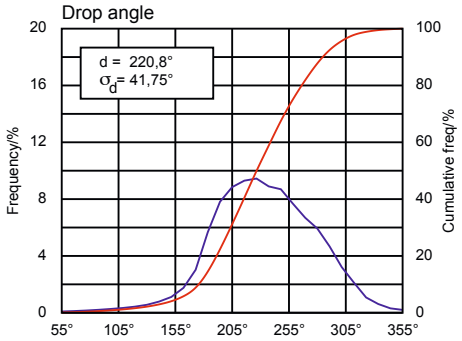
Material data sheet

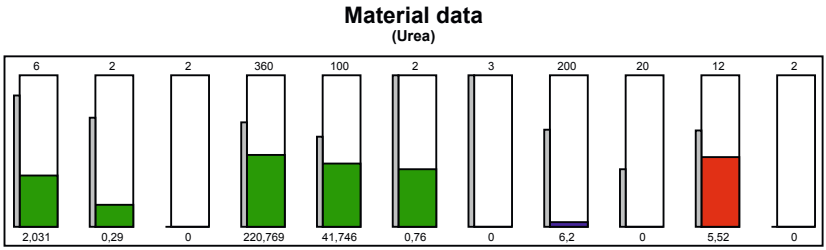
Material	LINZER® AGRO TRADE UREA 46N
Manufacturer	LAT - LINZER AGRO TRADE GmbH
Supplier	LAT - LINZER AGRO TRADE GmbH
Comment	

Material ID	430668
Material test ID	83008366
Date of test	2013-06-26
Operator	fball







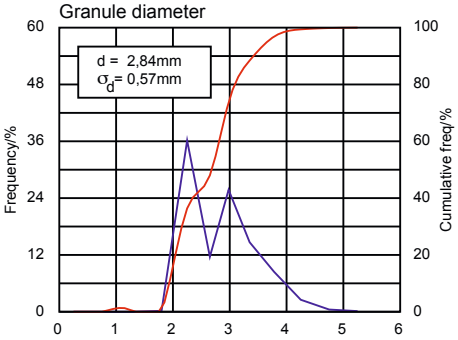


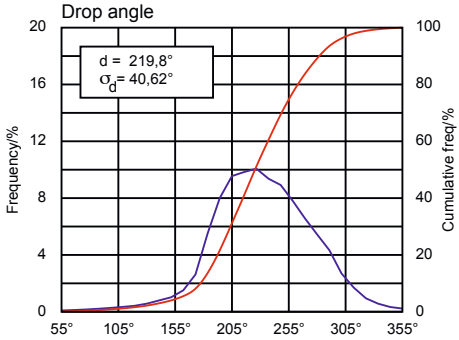
Material test 83007838

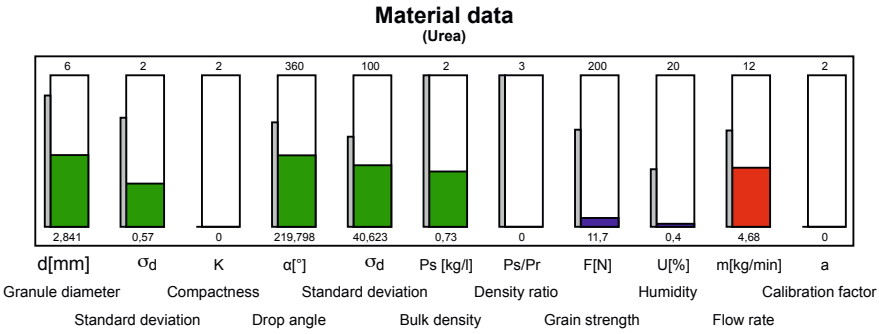
Material data sheet

Material	Harnstoff 46%N gepril. Jonava - Standard
Manufacturer	AB Achema
Supplier	Agro Baltic GmbH
Comment	

Material ID	400527
Material test ID	83007838
Date of test	2013-02-21
Operator	fball





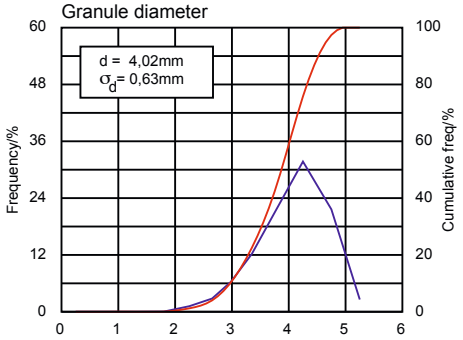


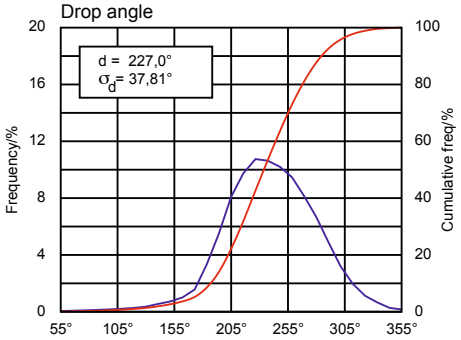
Material test 83008454

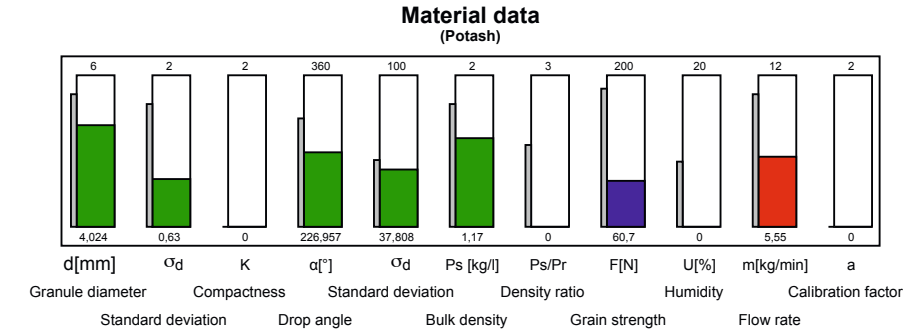
Material data sheet

Material	Korn Kali+6%MgO 40/6
Manufacturer	K+S Kali GmbH
Supplier	Triferto B. V. Goor
Comment	

Material ID	400306
Material test ID	83008454
Date of test	2013-07-24
Operator	hhoewe





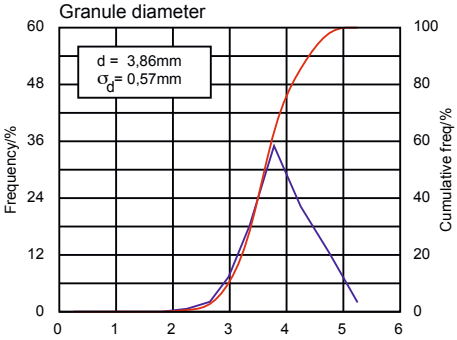


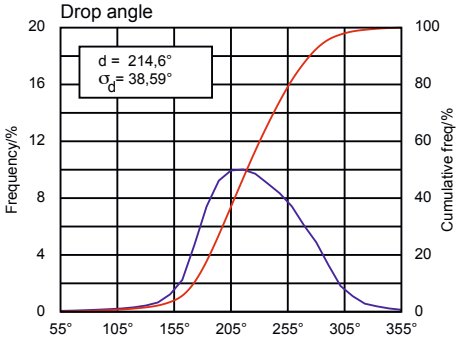
Material test 83008609

Material data sheet

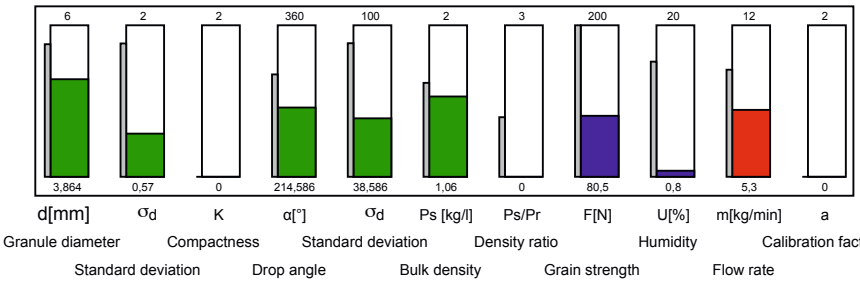
Material	Nutramon® 27%N gran. OCI Agro
Manufacturer	OCI Nitrogen B.V.
Supplier	Triferto B. V. Veendam
Comment	

Material ID	431869
Material test ID	83008609
Date of test	2013-09-26
Operator	fball





Material data
(Calcium Ammonium Nitrate)

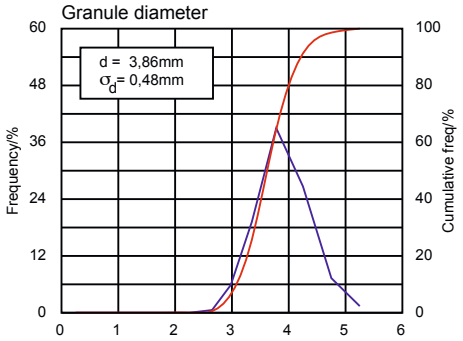


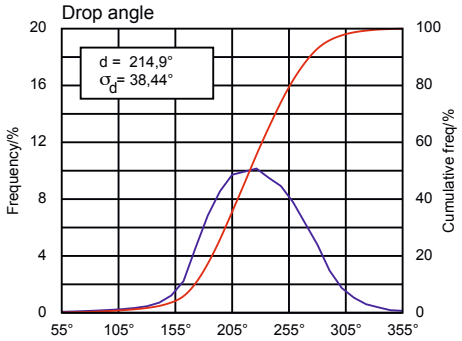
Material test 83008357

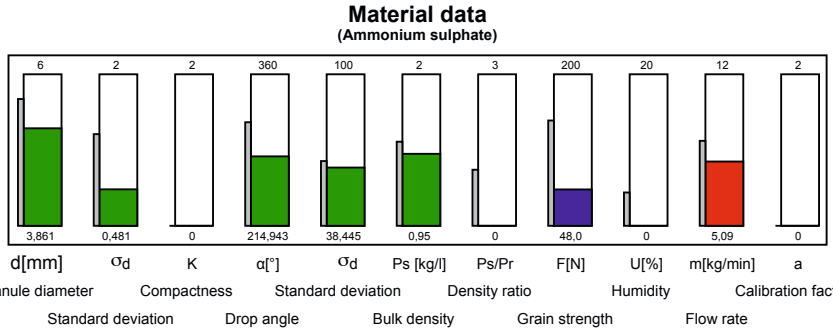
Material data sheet

Material	ass 26(+13S) EuroChem Agro GmbH
Manufacturer	EuroChem Agro GmbH
Supplier	Triferto B. V. Doetinchem
Comment	

Material ID	433411
Material test ID	83008357
Date of test	2013-06-18
Operator	fball





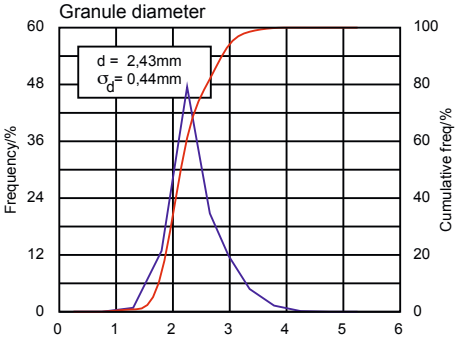


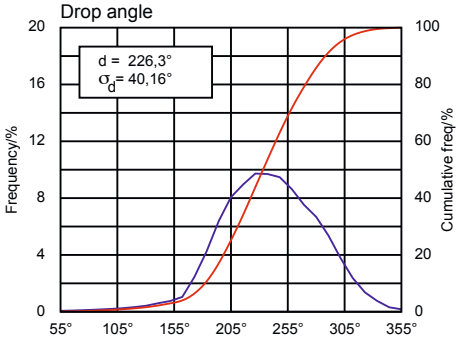
Material test 83008596

Material data sheet

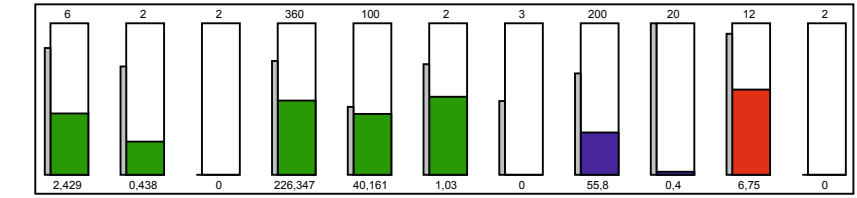
Material	Schwefels. Ammoniak 21%N DOMOGRAN® 45 Caproleuna
Manufacturer	DOMO Caproleuna GmbH
Supplier	DOMO Caproleuna GmbH
Comment	

Material ID	401556
Material test ID	83008596
Date of test	2013-09-20
Operator	fball





Material data
(Sulphate of ammonia)

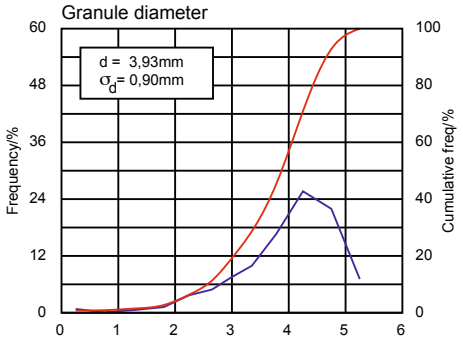


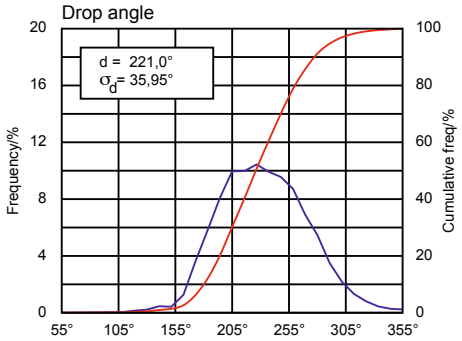
Material test 83009539

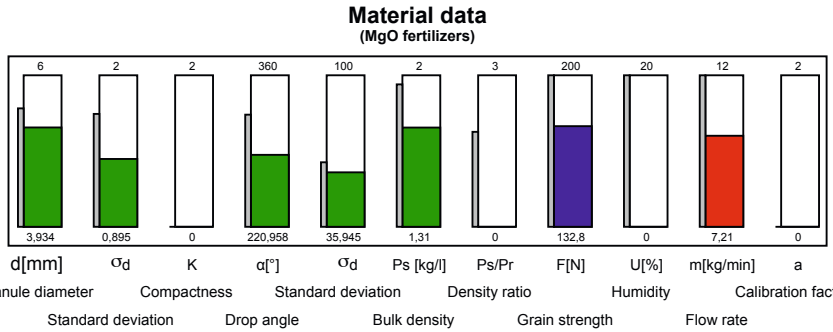
Material data sheet

Material	ESTA® Kieserit gran. K+S Kali GmbH
Manufacturer	K+S Kali GmbH
Supplier	Werner Wiemann GmbH
Comment	Versuche: Streuschaufelbeschichtung ZA-TS

Material ID	431848
Material test ID	83009539
Date of test	2014-03-06
Operator	ubuecker







10 Service Card for a fertiliser sample

Your contact information date _____

company _____ phone _____

name _____ mobile _____

street _____ fax _____

Post code, town _____ website _____

E-mail _____

farm size ha _____

How should the results be returned?

☐ post ☐ phone ☐ fax ☐ e-mail

Type of fertiliser spreader

☐ ZA-M ☐ ZA-M Ultra ☐ ZA-TS ☐ ZA-V ☐ ZA-X Perfect

☐ ZG-B ☐ ZG-B Ultra ☐ ZG-TS ☐ other _____

Machine serial number * _____

Existing spreading discs

☐ OS _____ ☐ OM _____ ☐ TS _____ ☐ V-Set _____

Boundary and border spreading device

☐ Limiter ☐ Tele-Set ☐ Hydro ☐ Telescopic blade _____

Required working widths

☐ 10 ☐ 12 ☐ 15 ☐ 16 ☐ 18 ☐ 20 ☐ 21 ☐ 24

☐ 27 ☐ 30 ☐ 32 ☐ 36 ☐ 40 ☐ 48 ☐ other ____ m

Fertiliser (important)

Description _____ Manufacturer _____

Trade name _____ Place of origin _____

Country of origin _____

Note

_____

_____

* Sorry, without a machine number processing is not possible!

In this way you can utilise AMAZONE's FertiliserService

The basis for the utilisation of the AMAZONE FertiliserService is a 5 kg fertiliser sample!

What have you got to do?

- Take five fertiliser samples (each 1 kg) at different places of the fertiliser store, sufficiently deep from underneath the surface
- Fill the fertiliser samples in a plastic bag, close carefully and pack in a cardboard box
- Secure the plastic bag inside the cardboard box against damage
- Fill in the service card
- Attach the completed service card to the package
- Write the sender name on the package and send to the following address:

AMAZONE DüngeService | Am Amazonenwerk 9–13 | D-49205 Hasbergen Gaste

What happens then?

After receipt at the AMAZONE FertiliserService, the fertiliser sample is tested as quickly as possible and the setting recommendations are sent to you in the desired way. Please send your sample in as early as possible as sample testing during the high season may require up to ten days.

What does it cost?

The first sample sent to the AMAZONE FertiliserService is free of charge!

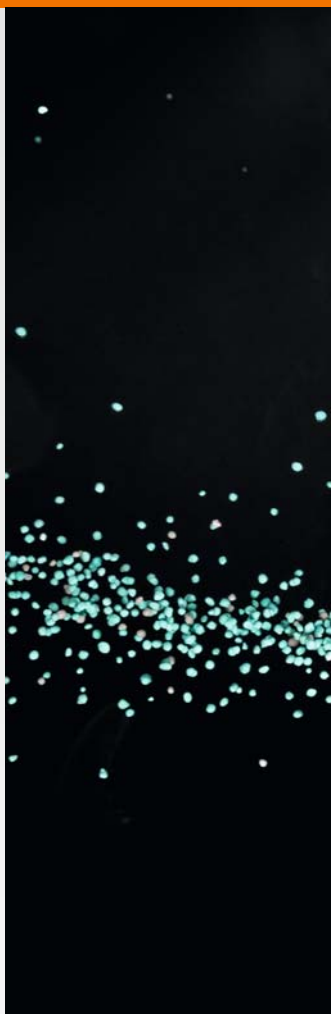
For every additional sample you will receive an invoice amounting to 25 € + VAT.

What do you need to know:

Even if the result of the fertiliser sample means that a clear assessment as to the setting values is viable, it is **impossible** for AMAZONE **to guarantee** the actual lateral distribution in the field. This particularly applies to blended fertilisers. Apart from the material properties of the fertiliser, the actual lateral distribution depends as well on many other things, such as, for example, the settings on the spreader, the maintenance condition of the spreader and the driving behaviour of the operator.

This service card you can also find as a download at:
http://www.amazone.net/servicecard

Notes:



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