



# Vizura<sup>®</sup>

Enhancing the value  
of your slurry.

The nitrogen stabilizer for liquid  
manure and biogas digestate

 **BASF**

We create chemistry

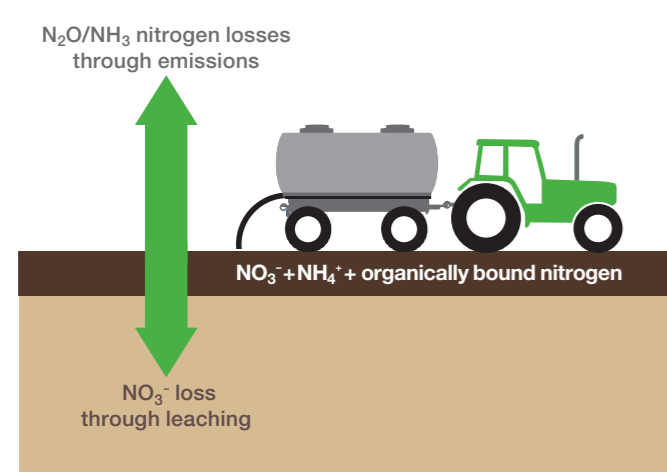


## DO YOU UTILIZE THE FULL POTENTIAL OF YOUR SLURRY?

Liquid manure and biogas digestate are valuable complex fertilizers. The available nitrogen needs to be taken up and used by plants as efficiently as possible. Therefore it is important to prevent the loss of nutrients associated with fertilization.

Vizura® stabilizes the ammonium nitrogen in the soil, thereby reducing losses and making it available to the plants when they need it. This is valuable for both, the farmers and the environment.

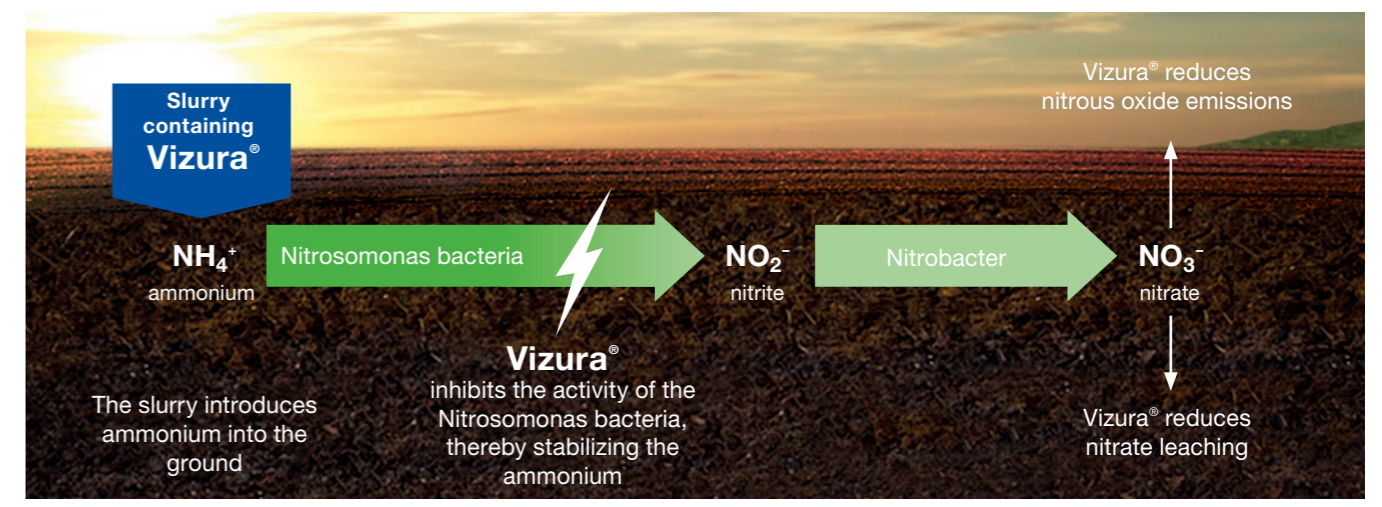
### Nitrogen loss during fertilization



### Avoiding nitrogen losses

Significant amounts of nitrogen are lost during and after the spreading of slurry. Nitrogen can be lost as ammonia (NH<sub>3</sub>) and nitrous oxide (N<sub>2</sub>O) into the atmosphere. The ammonium (NH<sub>4</sub><sup>+</sup>) is converted to nitrate (NO<sub>3</sub><sup>-</sup>) depending on environmental conditions, such as temperature and soil moisture levels. As nitrate is mobile in the soil, it can be washed off easily to lower soil layers and finally into the groundwater. BASF has developed the nitrogen stabilizer Vizura® to reduce nitrogen losses.

## Stabilization of ammonium nitrogen with the help of Vizura®



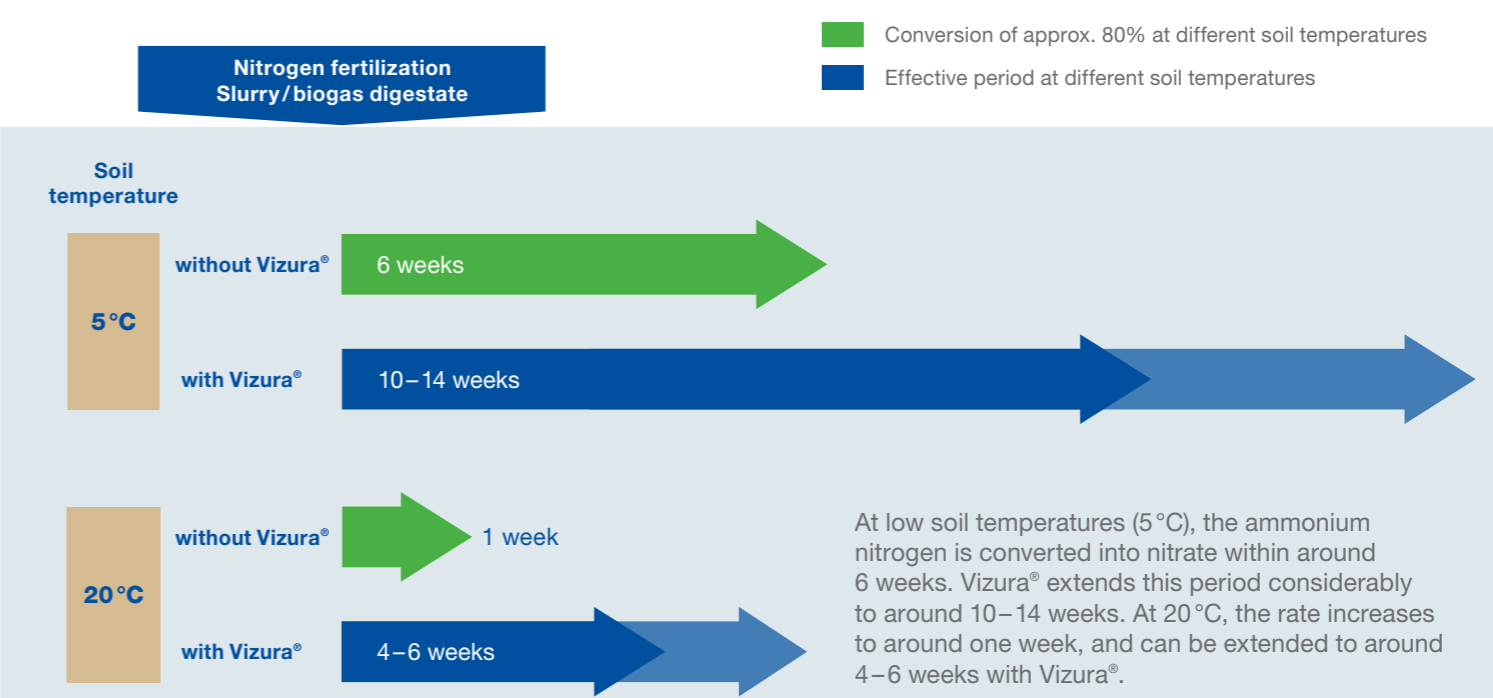
The addition of Vizura® to slurry slows down the conversion rate of ammonium to nitrate considerably. The active ingredient, DMPP, keeps the level of ammonium stable for a longer time by inhibiting the action of the Nitrosomonas bacteria which convert ammonium into nitrate. This prevents the nitrogen from leaching out of the soil, meaning it is protected and available to plants just when they need it. In addition, heavy rain results in a much higher risk of nitrate leaching, a scenario in which the performance and benefits of Vizura® are particularly important.

Nitrogen stabilization is particularly effective when the slurry is applied before sowing. Crops can continue to take advantage of the available nitrogen for several weeks after application, when crop demand is higher. Vizura® allows earlier slurry application which ensures optimum soil conditions helping growers to simplify farm operations.

Using Vizura® can lead to higher yields and reduces the need for additional mineral fertilizer application.

The image below shows how long Vizura® inhibits the conversion of ammonium into nitrate at different temperatures.

## Rate of conversion from ammonium to nitrate



At low soil temperatures (5°C), the ammonium nitrogen is converted into nitrate within around 6 weeks. Vizura® extends this period considerably to around 10-14 weeks. At 20°C, the rate increases to around one week, and can be extended to around 4-6 weeks with Vizura®.



## HOW CAN VIZURA® INCREASE NITROGEN EFFICIENCY AND THEREFORE YIELD?

Nitrogen is essential for plant growth and is a decisive factor in achieving good harvest results. Adding Vizura® to slurry improves its nitrogen efficiency, increasing yield and reducing the need for additional mineral fertilizer application.

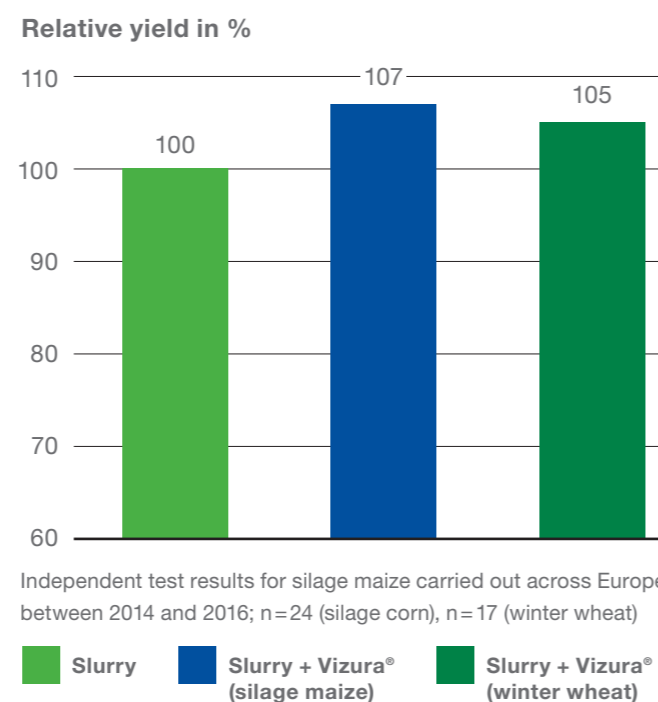
In addition, Vizura® prolongs the availability of ammonium in the ground which results in improved and continuous nutrition for plants.

### Increased yield through the use of Vizura®

Numerous studies at universities, research institutes and on different farms have proved Vizura®'s reliability as a nitrogen stabilizer and shown the increase in yield it achieves.

The available studies on silage maize and winter wheat have shown that adding Vizura® to slurry can increase yield by an additional 7% and 5% respectively, as compared to using slurry alone.

In addition to the economic advantages of increased yield, improved quality, and reduced need for additional mineral fertilization, Vizura® contributes to various ecological benefits: Lower levels of nitrate leaching into deeper soil layers and groundwater bodies as well as reduced greenhouse gas emissions.



### Advantages of ammonium-based plant nutrition

Essentially, plants are able to use both ammonium and nitrate to grow. By adding Vizura® to liquid manure and biogas digestate, the nitrogen remains longer in the soil in the form of ammonium leading to several benefits for crops.

In addition, ammonium cannot leach from the soil as nitrates do. Under many conditions, the ammonium nitrogen nutrition can result in the following advantages.

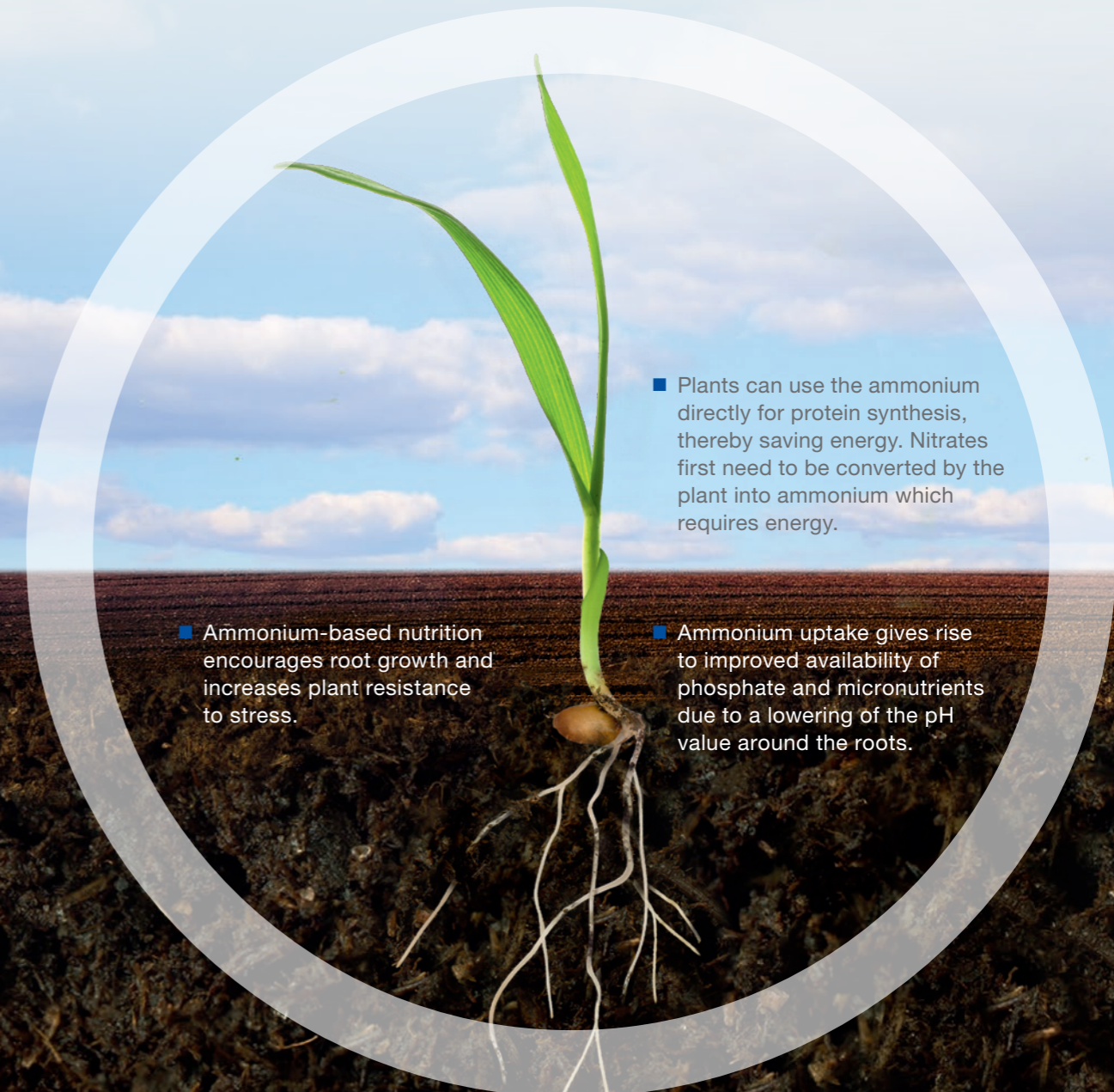
Experimental field trial carried out by the Danish Technological Institute, 2017



Without Vizura®

With Vizura®

Source: J. Sanz-Gomez, July 7<sup>th</sup>, 2017. Aabenraa (Denmark)



■ Plants can use the ammonium directly for protein synthesis, thereby saving energy. Nitrates first need to be converted by the plant into ammonium which requires energy.

■ Ammonium-based nutrition encourages root growth and increases plant resistance to stress.

■ Ammonium uptake gives rise to improved availability of phosphate and micronutrients due to a lowering of the pH value around the roots.



## HOW AND WHEN SHOULD VIZURA® BE APPLIED?

Vizura® can be used on all crops which are fertilized with slurry. It can be used in combination with all slurry application techniques. Thanks to its innovative formulation, Vizura® is easy to use and offers significant practical advantages.

Different dosage options allows Vizura® to be applied under different conditions. It is important to ensure homogeneous mixing with the slurry or liquid biogas digestate.

### Application periods for Vizura®

Vizura® can be used in combination with liquid manure or biogas digestate on all crops.

- **Maize:** Application of Vizura® before sowing
- **Cereals:** Application of Vizura® in the spring
- **Rapeseed:** Application of Vizura® just before sowing in the autumn or spring
- **Pasture:** Application of Vizura® at beginning of vegetation period and just after each cutting
- **Beets:** Application of Vizura® just before sowing
- **Potatoes:** Application of Vizura® before planting



Maize



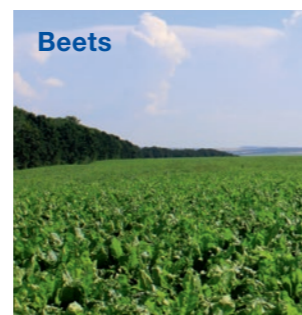
Cereals



Rapeseed



Pasture



Beets



Potatoes

## Vizura® dose rate and application techniques

Dose rates vary between 2.0 l/ha and 3.0 l/ha. The recommended dose rate depends on the type of slurry application and the depth of slurry incorporation, but it is independent of the type of soil, type of slurry, or crop.

**Vizura®  
3.0 l/ha**

at a depth of slurry incorporation of over 20 cm (e.g. plowing) and for all applications in late summer and fall.



**Vizura®  
2.0 l/ha**

at a depth of slurry incorporation of between 0–20 cm in spring (e.g. drag shoe, drag hose, or soil groove technique), as well as direct incorporation using a grubber or disk harrow.



Source: Wilfried Schliephake

## Vizura® dose rates

In order to ensure optimal stabilization of the ammonium nitrogen, Vizura® needs to be mixed as thoroughly as possible with the slurry.

Vizura® can be added on the farm either into the main slurry filling line or into the suction hose. It can be mixed in manually via a bypass or using a dosage system. It is important that Vizura® is evenly distributed in the slurry.

Using a dosage system will ensure that Vizura® is mixed in correctly. The dosage system can be used on the farm or installed directly on the vehicle. The remote control makes dosing from the driver's cab easy.

Please follow all safety instructions from the safety data sheet and the instructions set in the manual of the dosage system.



Addition via bypass



Addition via suction hose

Whichever way you look at it...

## VIZURA® – ADDED VALUE FOR YOUR SLURRY

- Stabilization of ammonium nitrogen over several weeks
- Significant increase in yield and crop quality
- Simplification of nitrogen management in crop rotation

# Vizura®

Enhancing the value of your slurry.



Giving heart to your environment.

# Vizura®

VIZURA® – THE SLURRY OPTIMIZER

- Improvement in plant nutrition due to prolonged uptake of ammonium nitrogen
- Enhances sustainable agriculture due to reduced nitrate leaching into groundwater and less nitrous oxide emissions into the atmosphere

Whichever way you look at it...



## HOW CAN THE USE OF SLURRY BE MADE MORE SUSTAINABLE?

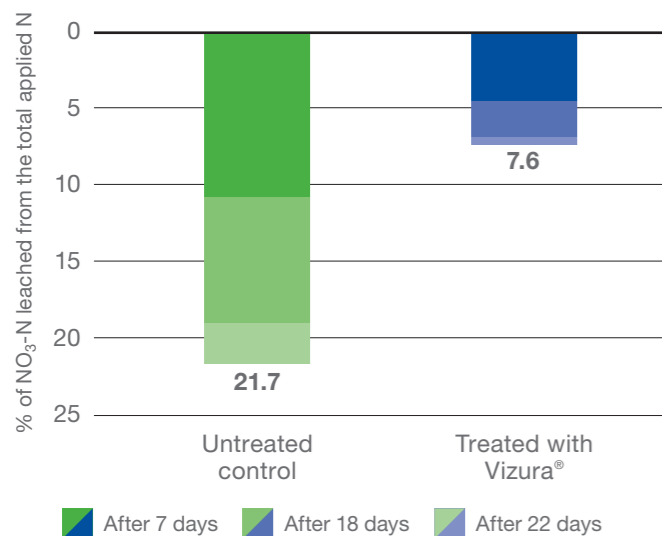
Vizura® reduces losses by stabilizing the ammonium nitrogen of slurry. The result? Improved nitrogen efficiency. The evaluation of Vizura® using the AgBalance™ method has shown that the use of Vizura® results in higher sustainability performance.

This outcome is based on less nitrogen being lost due to nitrate leaching and nitrous oxide emissions. As a greenhouse gas, nitrous oxide is around 300 times more damaging than carbon dioxide, making it a major pollutant and contributor to global warming.

### Less nitrate leaching

Numerous model tests and field trials have shown that nitrogen stabilizers are capable of considerably reducing the conversion from ammonium to nitrate. The result is reduced risk of nitrate leaching.

**Influence of DMPP on nitrate leaching several days after application**

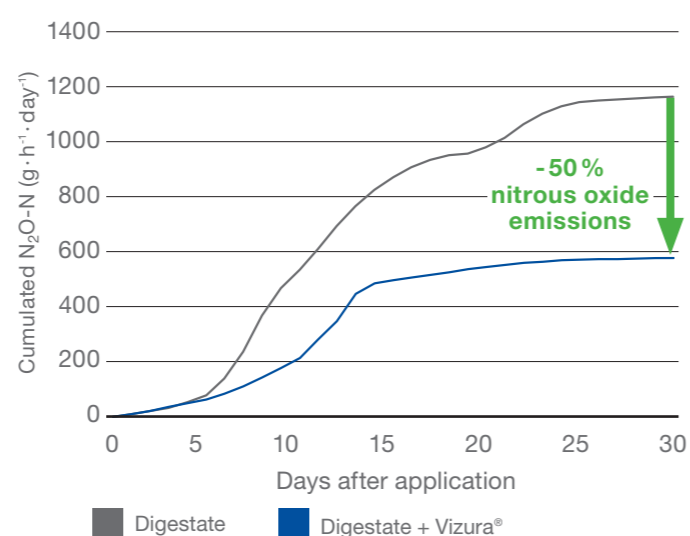


Zerulla et al., 2001

### Reduced nitrous oxide emissions

Vizura® also reduces the amount of damaging nitrous oxide emissions that are produced. Nitrous oxide builds up in the soil as a side effect of nitrification and denitrification.

**Influence of DMPP on nitrous oxide emissions from biogas digestate**



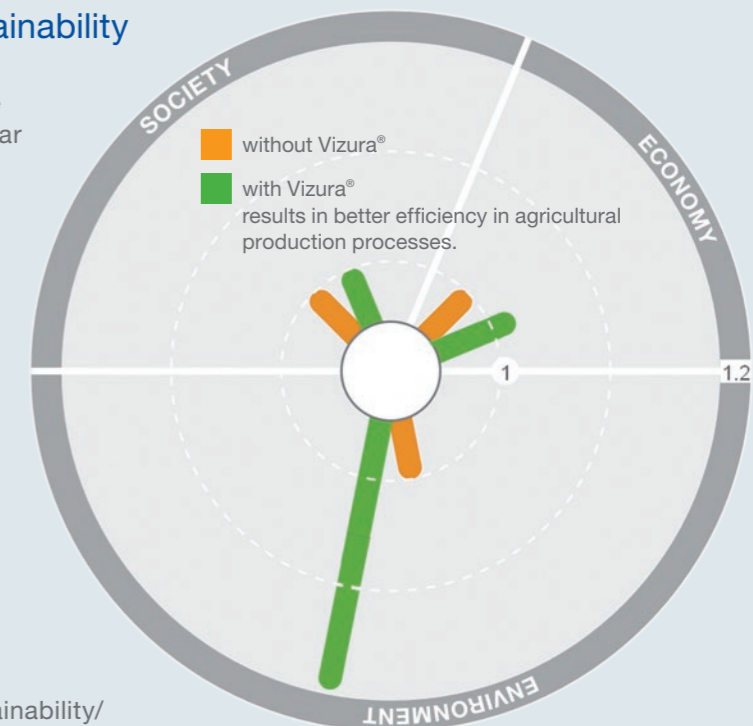
University of Milano; Sanz-Gomez et al., 2017

## AgBalance™ method demonstrates sustainability

How sustainable is the use of Vizura® in silage maize production? The AgBalance™ method provides a clear answer. This method involves testing and evaluating the sustainability in agriculture based on a life cycle analysis. The analysis takes into account ecological, economical, and social sustainability indicators. The result is a comprehensive profile of the sustainability of Vizura®.

As part of the analysis, typical silage maize production was tested in northwest Germany both with and without the addition of Vizura®. All of the production stages until and including the maize harvest were taken into account. The analysis showed that using Vizura® to stabilize the slurry led to improved results for both the economy and the environment (length of columns in diagram at top right of this page).

For further information, please visit [www.agro.basf.com/agr/AP-Internet/en/content/sustainability/measuring\\_sustainability/agbalance/index](http://www.agro.basf.com/agr/AP-Internet/en/content/sustainability/measuring_sustainability/agbalance/index)

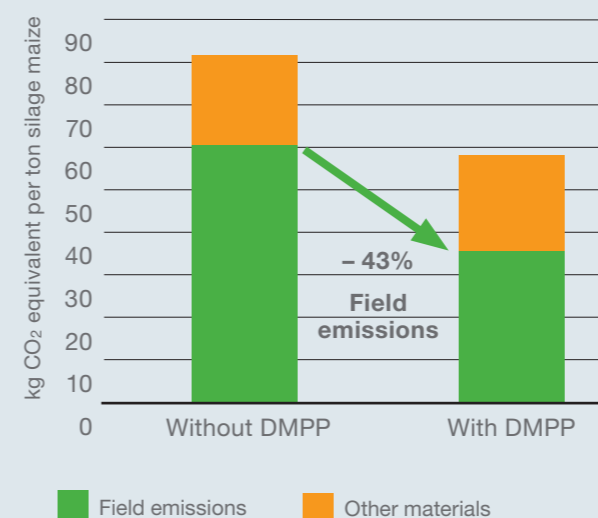


### Reduced greenhouse gases

The greatest contribution of the nitrogen stabilizer Vizura® refers to the environment due to its reducing effect on nitrous oxide emissions. The results are convincing: the use of Vizura® considerably reduces greenhouse gas emissions from slurry.

The graph of the results of the AgBalance™ study shows that Vizura® reduced emissions in the field by approx. 43%, thereby making a valuable contribution to the environment. Thus, Vizura® helps farmers contributing to a more sustainable agriculture.

**Greenhouse gas emissions when using agricultural fertilizers**



Calculations based on AgBalance™ study 2015, BASF  
TM = registered trademark of BASF





## IS NITROGEN AN ISSUE?

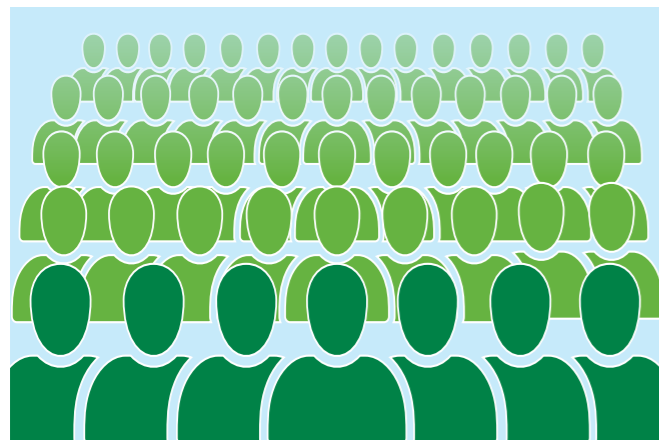
Nitrogen, no matter whether organic or mineral, is essential for people, animals, and plants. Though nitrogen fertilization is essential for human nutrition, too much nitrogen can result in ecological issues which have become more important to politicians, the media, and the society. Nitrate leaching, ammonia emissions, and nitrous oxide have all become familiar terms.

Slurry storage and application are sources of these pollutants. It has become increasingly important to make efficient use of slurry and biogas fermentation residues. A combination of improved spreading methods and the addition of Vizura® make this much easier.

## The importance of nitrogenous fertilizers

Nitrogenous fertilizers are essential for feeding the world's growing population.

Reactive nitrogen compounds such as ammonia, nitrate and the harmful greenhouse gas nitrous oxide can, however, damage the environment and biodiversity.

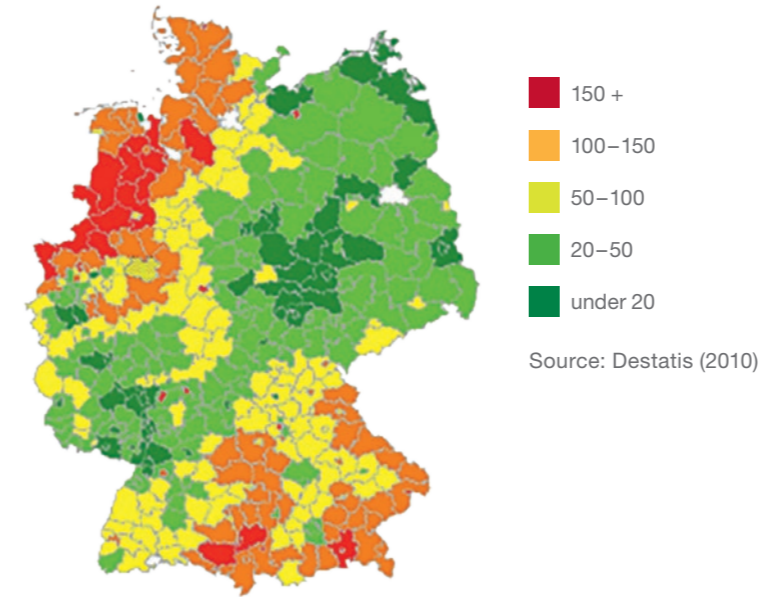


Food for a growing world population

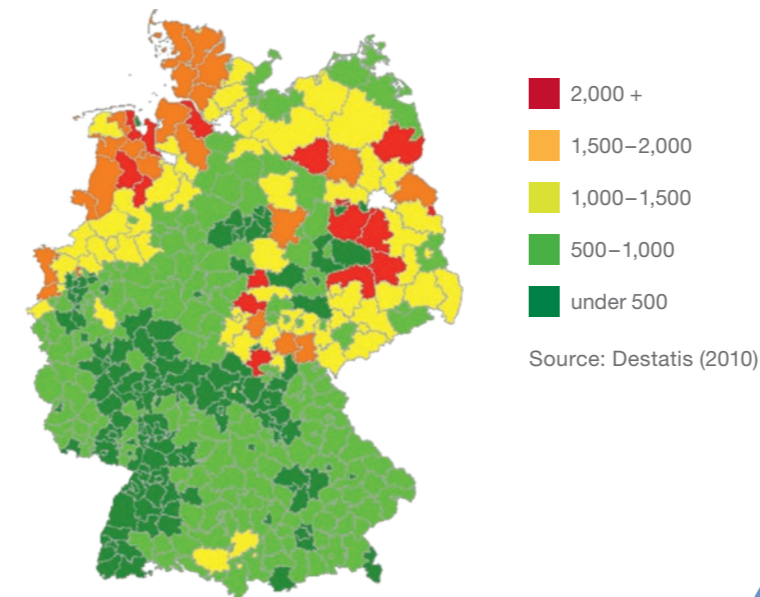


Consequences for the environment

Total quantity of nitrogen in slurry and biogas fermentation residues in kg N/ha agricultural land



Total quantity of slurry in m³ per company at county level



## The rise of slurry use in Germany; a real case example

In many parts of Germany, the high density of livestock results in increasing problems associated with slurry. In Germany, around 240 million cubic meters of slurry and biogas fermentation residues have been applied in 2014.

The maps show that the use of agricultural fertilizer is concentrated to a few specific regions. This results from the partial separation of animal and plant production over the years. The challenges in slurry management differ according to the region and the different farms, however Vizura® can improve nitrogen efficiency, lower nitrogen losses and allows to reduce additional mineral fertilizer application in all situations. The result? Great improvements in the nitrogen balance for all farms.

## More efficient use of nitrogen through minimizing loss

Efficient use of nitrogen is becoming increasingly important and requires more innovative solutions. This involves optimizing the application and use of slurry and biogas fermentation residues.

In order to reduce the emission of damaging ammonia into the environment, modern application techniques for both slurry and biogas fermentation residues have been developed. Drag hoses, drag shoes, injection, and the strip-till technique are good examples. These processes ensure that the slurry gets right into the ground, thereby reducing emissions. By using Vizura® additional nitrogen loss in the form of nitrates and nitrous oxide can also be avoided.





## WHAT DO STRICTER REGULATORY REQUIREMENTS MEAN IN PRACTICE?

The environmental pollution of nitrogen, either as nitrate loss into groundwater or as gaseous emissions into the air, are an increasing issue for policy makers. It is expected that future regulations will further limit the nitrogen use on grower level in order to reduce the environmental impact. As a result, farmers will be expected to show an improved nitrogen balance and to reduce surplus. This is possible with a more efficient use of slurry and the possibility to limit the need of applying additional mineral fertilizers.

Vizura® is a useful tool for ensuring effective nitrogen management. The active ingredient in Vizura® delays the conversion of ammonium to nitrate. This reduces nitrate leaching and nitrous oxide emissions, thereby improving nitrogen efficiency. Vizura® is a great contributor to sustainable agriculture and livestock production.

### The aim? Sustainable nitrogen management

With the nitrogen stabilizer Vizura®, farmers will be able to comply with the stricter fertilising legislation. Vizura® has been developed by BASF to improve the nitrogen balance and therefore result in more sustainable nitrogen management.

Agriculture is currently facing increasing challenges from volatile markets and more severe regulations to biotic and abiotic stress factors. BASF aims to offer high quality solutions that go beyond crop protection and fertilizer application.



## Regulations according to the fertilising legislation

The fertilising legislations govern good agricultural practice regarding the use of fertilizers. They also provide a framework for implementing the new nitrate guidelines.

By using Vizura®, it will be much easier for farmers to comply with the new guidelines contained in the fertilising legislations.

The amendment of the German Fertiliser Ordinance changes some legal requirements significantly.

### Vizura® contribution

Reduction of nitrogen emissions into the environment (displacement in soil, gas emissions)	+	+	+	+
Increase of nitrogen use efficiency	+	+	+	+
Contribution to reduced nitrogen Balance	+	+	+	

## Taking advantage of all optimization opportunities

The new German Fertiliser Ordinance restricts the possibility of application in summer and autumn. Therefore, we can assume that slurry and biogas digestate fertilization will be brought forward to spring – with all consequences, such as increased storage and application costs as well as greater time pressures.

The greatest effect of the revised fertilising legislations will probably be on fertilizer management, workload and operating costs. As a result, all of the different options for optimization should be looked at. The nitrogen stabilizer Vizura® is an important contributor to nitrogen management in slurry and biogas digestate.





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 **BASF**

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