

Fertilisation of maize after catch crops, based on the improved valorisation of organic fertilisers

Problem

Maize is one of the most important crops in Germany (approx. 22% of arable land), especially on dairy farms and farms with biogas production. Due to an often-inefficient use of available organic fertilisers, additional inorganic fertilisers are often applied as well. This often leads to nitrate leaching [DEBOER, 2017].

Solution

Nitrogen (N) can be used more efficiently and inorganic fertiliser usage can be reduced through the use of organic fertilisers, slurry injection and catch crops (whether these are leguminous or not) in maize cropping systems. Indeed, the implementation of catch crops mitigates nitrate leaching during the winter and keeps it available for the following crop.

Advantages

The combination of catch crops including legumes and organic fertiliser injection stabilises yields and reduces costs for inorganic fertilisers. At the same time, N losses to the environment through leaching and gaseous losses are reduced.



Applicability box

Theme

Multiple cropping, cropping system, field

Geographical coverage

>80 mm precipitation in early autumn, at least 8 weeks of growth of vegetation after harvest of main crop, sandy to loamy soils (good warming in spring)

Application time

After harvest of main crop followed by maize in the coming year

Required time

3h/ha (sowing of catch crop & slurry application in maize)

Period of impact

Next cropping season with increasing benefits over the years due to increasing organic soil N reserves and carbon stock

Equipment

Slurry injection, single-grain seeder (GPS control)

Best in

Maize on dairy farms and farms with biogas production



Picture 1 (left): Sowing catch crop combined with tillage (Photo: Markurs Cordsen, CALS); Picture 2 (right): Injecting organic fertilisers before sowing maize (Photo: Wolfgang Ehrecke, CALS)

Practical recommendation

Catch crop:

- If following an early harvested cereal (up to mid-August), sow a catch crop mix (Picture 1) including legumes. Legumes in catch crops will fix atmospheric nitrogen and will grow best if sown between June and mid-August, due to higher temperatures. Otherwise, sow a legume-free catch-crop mix.
- Sowing density depends on the included species' seed weight, for more details see: <https://www.lwk-niedersachsen.de/services/download.cfm?file=30411>

- If the catch crop is still healthy and has survived the winter, cut or mulch the catch crop to avoid seeding and prevent growth between January and early March
- Dense residue cover may interfere with slurry-injection in later stages and so residue incorporation is needed two weeks before the organic fertilisation of maize
- **Maize:**
- Reduce planned N-fertilisation by 20-30 kg N/hectare for legume-free catch crops and 40-60 kg N/hectare for mixtures with legumes (depending on climate)
- Inject liquid organic fertiliser (up to 30m³/hectare) 5-7 cm deeper than planned sowing depth (Picture 2)
- To avoid soil compaction, wait for adequate soil humidity for slurry injection
- Sow maize in strips directly over the injected slurry lines
- Finish N fertilisation early with inorganic N-fertiliser if necessary (Table 1)
- Under drier conditions, low phosphorus (P) soil content or other less suitable conditions, reduce organic fertilisation and add the same amount of inorganic NP-fertilisers

Table 1: Example of maize fertilisation strategy, based on liquid organic fertiliser, after a catch crop

Strategy	N [kg/hectare]	P ₂ O ₅ [kg/hectare]
Demand (45 tons/hectare fresh matter)	200	90
Release - catch crop without legumes	-25	0
Release - soil	-35	
30 m ³ of liquid fertiliser injection (70% N-availability)	(will increase over years)	
Inorganic fertilisation	-105	-90
Nutrient balance	-25	
	-10	0

Further information

Further reading

- de Broer, H. (2017). *Nitrate leaching from liquid cattle manure compared to synthetic fertilizer applied to grassland or silage maize in the Netherlands*. Wageningen: Wageningen Livestock Research
- Schaper, I. & Hoffmann, A. (2021) *Zwischenfruchtanbau durch Leguminosen optimieren?* Chamber of Agriculture Lower Saxony

Weblinks

- Results of field trials regarding water protection, Chamber of Agriculture Lower Saxony
- Optimization of cover crops with legumes, Chamber of Agriculture Lower Saxony
- Project “Optimizing of nitrogen- and phosphate-efficiency of liquid organic fertilizers by “depot-application” to minimize environmental impacts”

About this practice abstract and DiverIMPACTS

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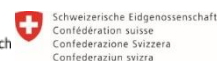
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