While some studies agree that drought increases both NH4+ and NO3- contents content in soil (Deng et al., 2021; Hartmann et al., 2013; Ullah et al., 2020), others reported the amount of NO3- content was remained unchanged or even decreased in response to drought (Canarini et al., 2021; Séneca et al., 2020). Nevertheless, these indicate that the effect of drought on mineral N pools varied depending on type of ecosystem (Deng et al., 2021; Fuchslueger et al., 2014), agricultural practice (), as well as vegetation period (Hammerl et al., 2019).

This inconsistency is due to the effect of drought on mineral N pools is different by type of ecosystem (Deng et al., 2021; Fuchslueger et al., 2014), agricultural management system (), as well as vegetation period (Hammerl et al., 2019).

declined mineral N consumption, for example, it might related

To date, the impact of long-term management on N provisioning from organic fertilizer and its underlying functional microbial communities under future projected drought scenarios has not been thoroughly investigated. We consider knowledge gain about N provisioning from organic fertilizers and its underlying processes to be highly relevant in order to develop fertilization strategies in a rapidly changing environment.

The current work simulates rainfall variability in controlled environment experiments using soil from the “DOK” farming system comparison trial (bio-Dynamic, bio-Organic, and “Konventionell”; [Mäder et al., 2002](https://www.frontiersin.org/articles/10.3389/fenvs.2018.00040/full#B44)).

different outcomes were observed in the different outcomes were observed in the

We hypothesized that drought will create an optimal living condition for nitrifiers, thus increasing the nitrification process. The observed changes of mineral N under drought treatment may associates with changes in soil microbial activities related to N mineralization (Chen et al., 2017).

In this study, we found that drought treatment largely affected the mineral N pools and that the effect of drought depended on the cropping system

As expected…

-cropping system on N-pools in relation to literature (diff between cropping )

-drought X cropping system

-resilience or not?

Drought can have consequences on the structure of microbial communities related to N-mineralization and N-cycling because water availability controls their growth and determines whether they will remain active or dormant in soil (Metze et al., 2023). Ammonia-oxidation is considered as the first and rate-limiting step of nitrification (Lehtovirta-Morley, 2018; Séneca et al., 2020) performed by ammonia-oxidizing community, and any environmental perturbations may alter the whole process of nitrification. We conducted ammonia-oxidizing community assessment as a proxy for nitrification to better understand how drought affects this pivotal process in different cropping systems.

Another notable observation was the impact of drought on the AO community structure was more pronounced in the BIODYN systems.

Overall, mineral-conventional cropping system (CONMIN) had lowest percentage of affected ASVs, suggesting that…

These N2O producers are sensitive to drought stress and their responses may vary, depending on their physiological and biochemical

characteristics, as well as soil conditions (Li et al., 2019; Stein, 2020; Xu

et al., 2020).

These results demonstrate that distinct groups of AO respond differently to drought treatment, and that the effect of drought controlled by the cropping system.

The effect of drought on the structure of AO communities is not consistent across studies. For example,

Previous studies reported that soil’s physicochemical properties and abundances of related microbial genes are key factors in determining soil nitrification and denitrification ([(Feng et al., 2024)](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8727462/#B46); [Li et al., 2009](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8727462/#B52); [Hynes and Germida, 2012](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8727462/#B44); [Zhang et al., 2017](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8727462/#B95); [Zhang and Ji, 2018](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8727462/#B94)).

The opposite response was observed on *amoA* gene abundance. , the abundance of AOB and comammox clade B were more affected by drought, particularly in the ccon

The diverging responses to drought between cropping systems likely related to different concentrations of soil NH4+ between organic and conventional systems.

The differences

Previous studies revealed different sensitivity of AO groups to drought. For example,

heavy impact of agricultural practice (e.g. fertilization) as well as drought stress on nitrifiers

Inconsistently, several previous results indicated that AOA was more resistant to drought compared to AOB

Fitting environmental variables in the PCoA plot showed that NH4+ had contribution on the community structure, which also supports the argument. Previous studies reported

Previous works show that the sensitivity of AOA community to drought might be explained by their sensitivity to NH4+ concentration.

Almost all ASVs belonging to the genus *Nitrosolobus* were negatively impacted by drought.

Our study could not detect the resilience of those affected ASVs as showed because we observe were still affec