**Results**

**Sequencing Summary**

We successfully obtained a total of 1 806 442, 1 528 985, and 1 924 171 quality filtered reads of AOB, AOA, and comammox *amoA* genes, respectively, from 120 bulk soil and 72 rhizosphere samples. Amplicon Sequence Variants of AOB, AOA, and comammox generated from the rarefied reads were 1 222, 592, and 632 ASVs, respectively. Rarefaction curves of all samples reached asymptotes and showed sequencing depths were sufficient to capture all of the representative communities in the samples (Supplementary Fig. 1: rarefaction curve).

**Effects of drought on ammonia-oxidizers diversity and composition**

There were no differences of observed richness and Shannon diversity index between drought and control of the AOB and AOA community in bulk soil and rhizosphere (Table S1: statistical analysis).