[O21] Cropping System / Crop Rotation

Chair: Katsuyoshi Shimizu (Kagoshima University, Japan)
Chair: Weidong Cao (Chinese Academy of Agricultural Sciences, China)
2021年9月9日(木) 09:45 ～ 11:45 Room 2 (Oral) (Farming System)

11:10 ～ 11:25

[O21-06]Long-term Crop Response to Discontinuation of Fertilizer Input in a Wheat-Maize Cropping System

*Nominated for Presentation Awards

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Modern intensive cropping systems rely on the excessive application of inorganic fertilizers. The importance of inherent soil fertility is often ignored owing to the complexity of relationships between crop productivity and soil properties in fields with continuous fertilization. Here, our goal was to improve understanding of long-term crop responses to soil nutrient availability. We suspended fertilizer application since 2007 for 11 years in maize-wheat rotation, but continuously applied standard N-P-K rates from 1993 to 2018 in control. Crop biomass and N uptake decreased to 29%-69% of the control in wheat and 28%-76% of the control in maize during 2008-2011 after the suspension of fertilization, and subsequently stabilized at 10%-41% of the control in wheat and 31%-73% of the control in maize from 2012 to 2018. Compared with wheat, maize showed reduced harvest index and grain weight and less of a decrease of leaf area index at the expense of specific leaf N, but a greater decrease of radiation-use efficiency, which highlights the contrasting adaptation strategies of the two species to the cessation of fertilization. Spatial analysis of crop growth and soil characteristics showed that grain yields of both species without fertilization were associated with both total and available soil N. Large within-field variation in yield (CV: 42% to 52%) after 3 years of suspended fertilization resulted from a slight variation in soil N availability (CV: 9%). Our findings can serve as a reference for maintaining soil nutrient and crop productivity in cropping systems with more efficient resource use.