Book of abstracts

Phosphorus in Soils and Plants Symposium

Towards a sustainable phosphorus utilization in agroecosystems

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abstracts

Theme 1 - Phosphorus forms, availability and cycling in soils
Oral presentation

Accumulated effects of contrasting phosphorus balances in the evolution of soil available phosphorus

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Sustainable phosphorus management requires fertilization strategies that avoid both under- and over-fertilization to minimize plant P deficiency while preventing excessive P accumulation and water contamination. While national information is available about critical P levels above which no responses to P fertilization are expected, less is known about the evolution of P availability under different P balances. Our objective was to evaluate the relationship between P balance (P fertilization minus P removal in grain) on the evolution of soil P availability (P Bray I analysis). We installed four experimental sites with contrasting initial P values: low (12.4 µg g^{-1}), high (41.6 µg g^{-1}), and optimal (18.5 and 20.5 µg g^{-1}). Each site received two contrasting fertilization treatments: no P fertilization vs fertilization rates to reach and maintain soil P Bray I between 16 and 20 µg g^{-1}. Averaged over 5 years, the lack of fertilization resulted in negative P balances that ranged between −11 and −19 kg P ha^{-1} yr^{-1} in each site. In three of the sites these negative balances resulted in a decrease in soil P levels ($p < 0.01$), but the magnitude of the decrease was site-dependent, and a loss of 1 µg g^{-1} P Bray I was observed every 5 to 12.5 kg P ha^{-1} of accumulated negative balance. The P balance of the fertilized treatments varied depending on the initial values of each site (which defined the fertilization rates) and was between −10 and +9 kg P ha^{-1} yr^{-1}. Interestingly, we did not find a significant relationship between positive P balances and soil P. Our results suggest that losses of P availability in response to negative balances are site-dependent and that neutral P balances do not always result in stable soil P levels, highlighting the importance of frequent monitoring of soil P availability.