

## iSQAPER PhD Student Research Information

### Research Title

Long-term fertilizations on spatiotemporal dynamics of soil microbial communities in a fluvo-aquic soil

### Abstract

As the main driver of soil carbon and nitrogen changes, soil microbial communities were studied intensively in cropland soils in the past few decades. Microbial biomass and extracellular enzyme activities were examined under different fertilization regimes. It however remains unclear how long-term fertilizations affect the spatial heterogeneity of microbial biomass and extracellular enzyme activities, indicators of microbial communities dynamics. Studies with decade long continuous management are rare. Based on a more than two-decade long fertilization experiment in a fluvo-aquic soil in Zhengzhou China, this study will quantify the mean difference and the spatial distributions in both microbial biomass and EEA in addition to soil carbon and nitrogen between different fertilization regimes.

Surficial soil samples will be collected and measured in two seasons of post-harvest and growing season. The fertilization treatments include non-fertilizer (CK), chemical fertilizer and straw (NPKS), chemical fertilizer and manure (NPKM), chemical fertilizer (NPK). A soil decay model method will be also employed based on a two-year high-frequency climate data collections. This study is expected to elucidate the central tendencies and spatial heterogeneity of soil microbial dynamics and is hoped to improve the representation of microbial functions in soil decay modelling.

### Objectives of the research

The research objectives are (1) to examine the mean difference in soil microbial biomass and extracellular enzyme activities under long-term fertilizations; (2) to elucidate the spatial distribution of soil MBC and EEA under different fertilization regimes; and (3) to test soil decay modeling with microbial functions.

### iSQAPER study site

Long-term fertilization and fertilizer efficiency site is located in Zhengzhou City, Henan Province. It is located in the lower Yellow River alluvial plain, flat terrain, with an average elevation of 59 meters. the average annual rainfall is 645mm, with an average annual temperature of 14.4°C. The soil is sandy loam soil in this experiment station, the parent material of this soil is the Yellow River alluvial soil, organic matter content 4.4-10.6g / kg, TN 0.4-1g / kg, total phosphorus 0.5-0.65g / kg, total potassium 1.7g / kg, PH 8.1-8.4. This experiment station began in 1987, after two years of planting evenly, starting different fertilization methods and cropping systems in 1990, a total of nine kinds of treatments, one of which is non-crop planting, and the rest of winter wheat - summer maize rotation mode, "Winter Wheat - Summer maize" eight kinds of handling rotations were no fertilizer(CK), conventional NPK(NPK), conventional nitrogen(N), nitrogen and phosphorus(NP), nitrogen and potassium(NK), NPK and manure(NPKM), NPK and straw(NPKS), 1.5 times NPK and manure(1.5NPKM). All the above fertilization treatment with the same amount of nitrogen, organic nitrogen and inorganic nitrogen ratio of the 7: 3, N: P2O5: K2O = 1: 0.5: 0.5, the quarterly amount of fertilizer for wheat N165kg/hm<sup>2</sup>, P2O5 to 82.5kg /hm<sup>2</sup>,K2O82.5kg/hm<sup>2</sup>, quarterly corn fertilizer nitrogen 187.5kg/hm<sup>2</sup>, P2O593.8kg/ hm<sup>2</sup>, K2O93.8kg/hm<sup>2</sup>, nitrogen is urea with 45% of nitrogen, phosphorus as superphosphate, containing P2O5 12.5%, potash is potassium sulfate, containing K2O 50%.

### Partners in this research

Professor Jianwei Li, Professor Qimei Lin, Professor Minggang Xu, Associate professor Yinghua Duan

### Contact Details

<i>Name:</i>	Hongling Ye	
<i>Institute:</i>	Institute of Agricultural Resources and Regional Planning, Chinese Academy of Agricultural Sciences	
<i>Address:</i>	No 12 Zhongguancun South Street, Haidian District, Beijing 100081, P.R. China	
<i>Contact:</i>	E-mail address: yhl228007@163.com Phone number: +86-15231885857	