EGU General Assembly 2021

Quantitively and novelty source fingerprinting N and P pollutants in sediment: Case study in a small catchment, North China

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26 April, 2021

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CHINESE ACADEMY OF AGRICULTURAL SCIENCES

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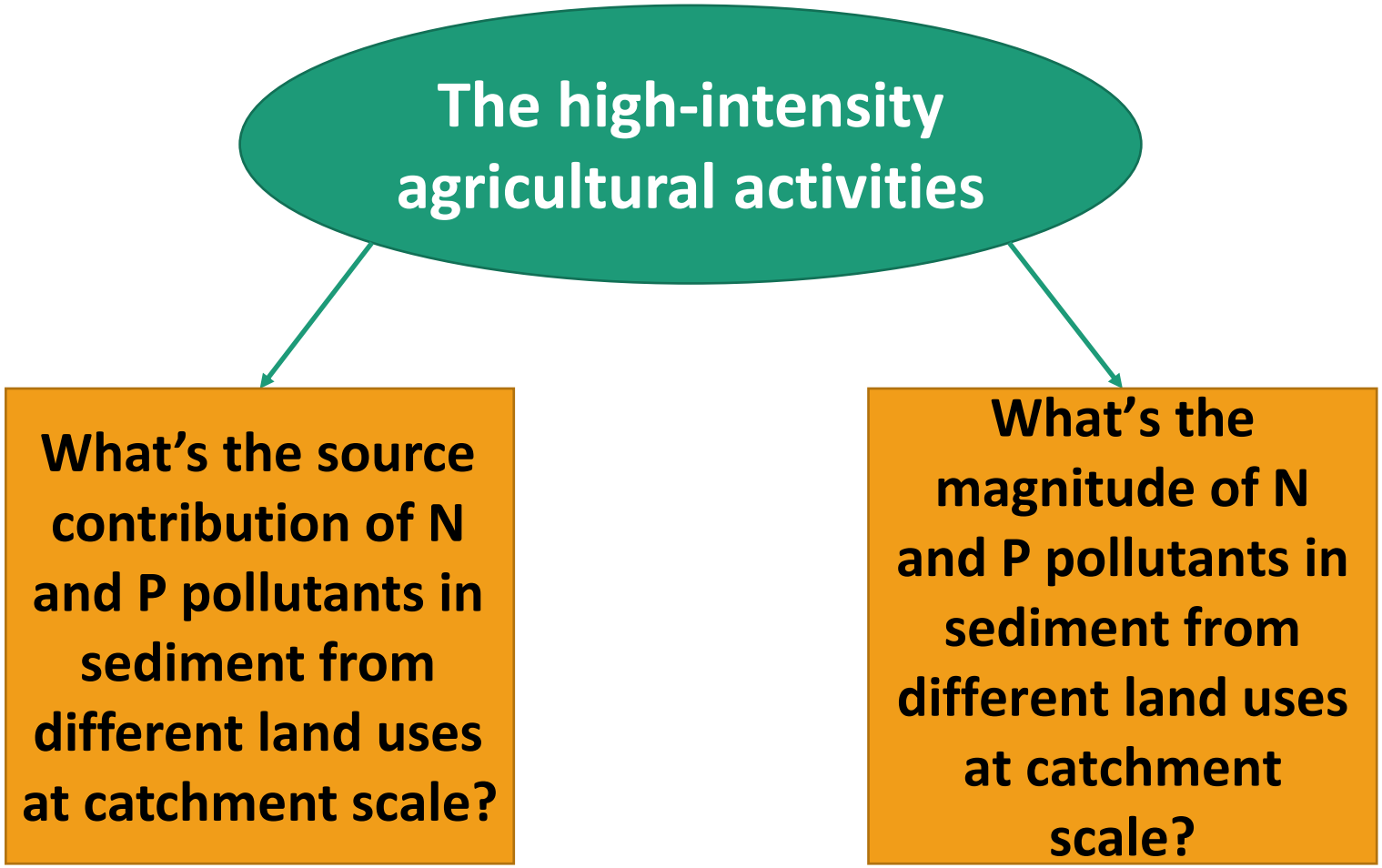
1. Background

- The intensive farmland in north China accounts for more than 17 % of China's arable land. It is the main grain producing area in China.
- Consequently, excessive use of chemical fertilizers and pesticides, as well as rural household waste, is a problem in the region.

Questions arise:

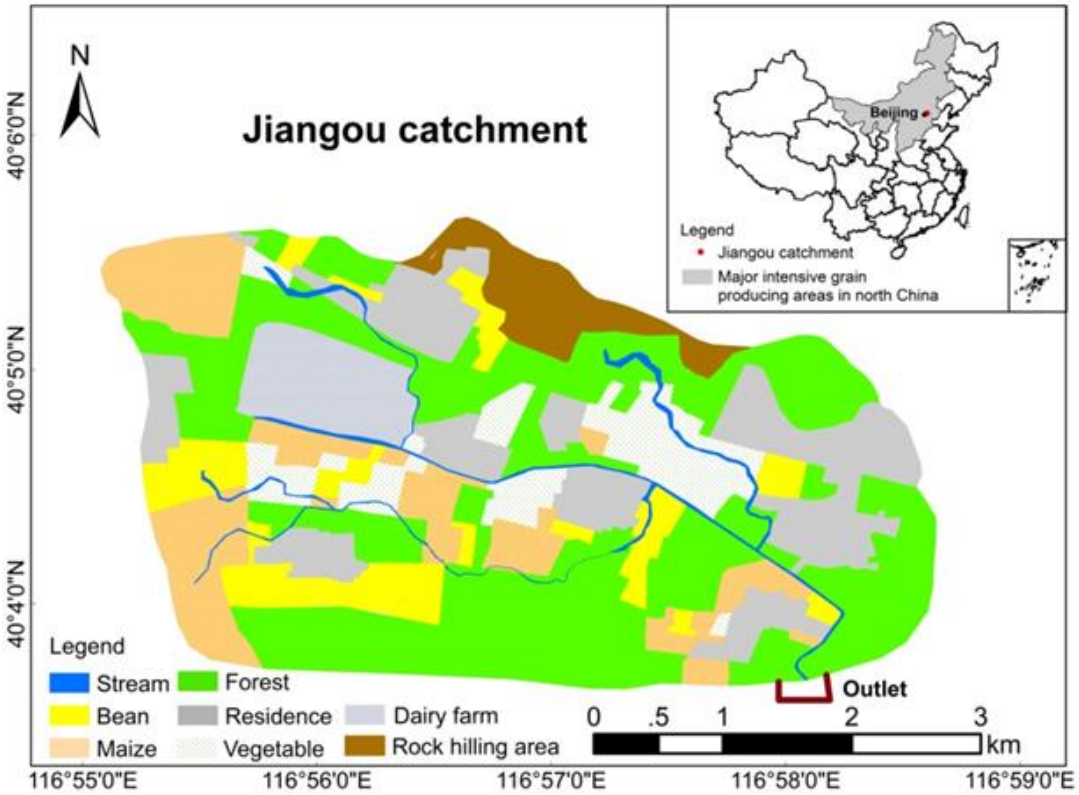


2. Study objectives

The integrated use of FRNs and CSSI fingerprinting techniques to reach below objectives:

- to identify the source contribution of N and P pollutants in sediment from different land uses in the catchment;
- to quantify the N and P loads in the sediment from different land use type management.

Study area and sampling strategy



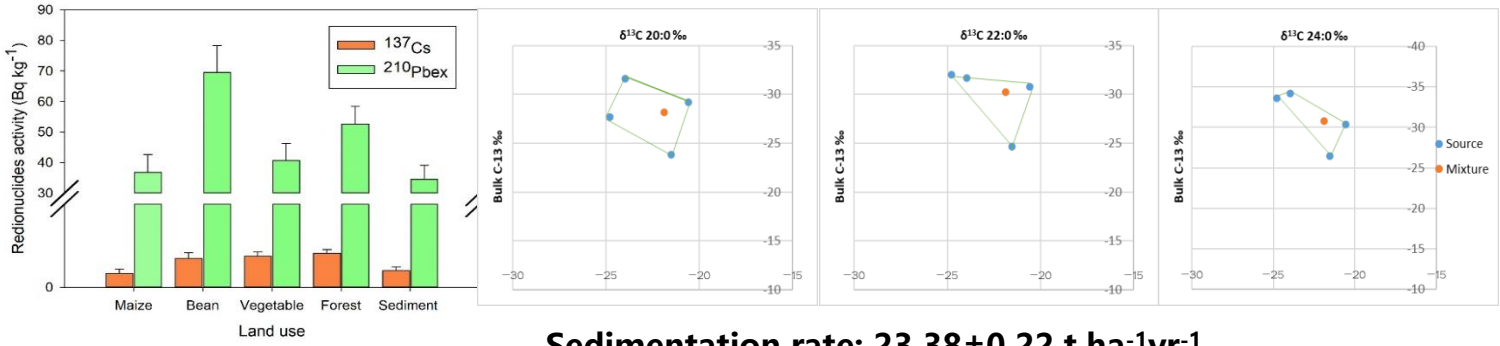
- **Area:** 13.85 km^2
- **Mean rainfall:** 656 mm
- **Geography and hydrology:** Gentle slope topography and the catchment surrounded by mountains; the upstream of the catchment was dairy farm and downstream was Ju River.
- **Land uses:** Forestland, maize, vegetable, and bean farmlands are the four main land-use types.

- **Surface (0-2 cm) soil and sediment samples** were collected from different plant species for compound specific stable isotope (CSSI) and ^{137}Cs and $^{210}Pbex$ (FRNs)
- **Subsurface (5-30 cm) soil samples** were collected from channel bank for FRNs.
- **^{137}Cs cores (0-60 cm)** collected at the outlet of the catchment and also **reference sites**.

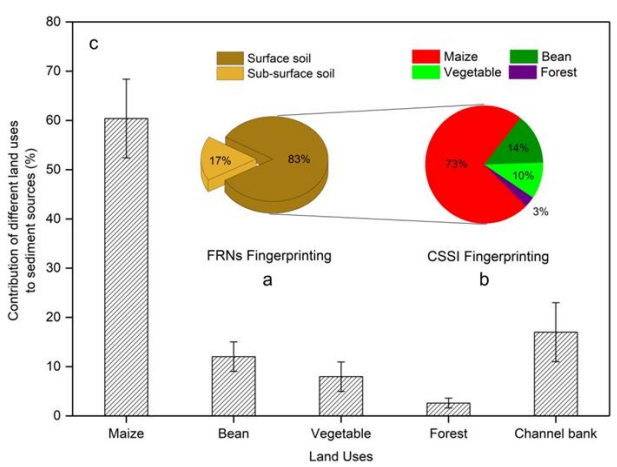
Mixing models used for apportioning sources contribution

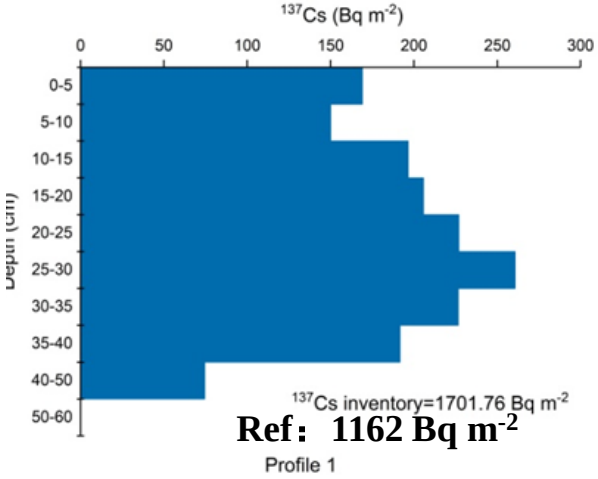
- **Isotopic mixing model IsoSource (Phillips and Gregg, 2003)**
- **FRN two-end mixing model (Collins and Walling, 1997)**

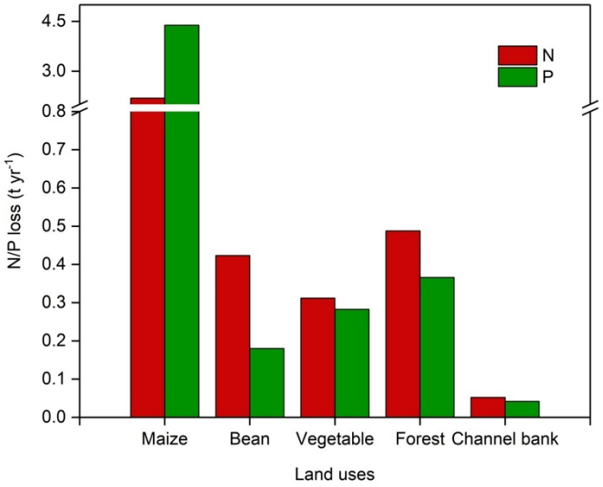
Quantitively identify the contribution of N and P from different land uses to the sediment in the catchment based on FRNs and CSSI data



Sedimentation rate: 23.38±0.22 t ha^{-1}vr^{-1}







- Combining FRNs and CSSI fingerprinting techniques, the dominant sediment source was derived from maize farmland (60±8%), the followed were channel bank(17±6%), bean farmland (12±3%) and vegetable farmland (8±3%), respectively, and least contribution from forestland (3±1%).
- The sedimentation rate of 23.38±0.22 t ha^{-1} yr^{-1} of this catchment was quantified by ^{137}Cs cores. Based on the measured of N and P concentrations in source samples, and areas of land uses in this catchment, we quantitatively estimated that the N and P pollutants in sediment were dominated from maize farmland (2.19 and 4.39 t yr^{-1}, respectively).

Acknowledge

- Fundings:
- The International Atomic Energy Agency under RAS5084
- Agricultural Clean Watershed Group, CAAS
- Cooperation:

Thanks for your kind attention!