



The effect of long-term fertilization on soil water dynamics and WUE in a field experiment of black soil region in Northeast China

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1. Introduction

- Soil water is a limiting factor in semi-arid agricultural ecological systems
- Fertilization and soil water are related because increased fertilizer could stimulate deeper rooting of crop, increasing the quantity of stored soil water available to the crop, thereby reducing potential water stress, then increasing crop yield
- It has been well known that black soil has a large capacity for water retention, therefore, it is very important for better manage the soil water capacity of the black soil

2. Objective

- The objective of this study was to examine soil water storage and soil water supply for crops in black soil region in Northeastern China under three fertilizer treatments including: no fertilizer (CK), chemical fertilizer (NP) and chemical fertilizer plus pig manure

3. Materials & Methods

- Study site: Hailun National Field Research Station of Agro-ecosystem in China
- Climatic conditions: Semi-arid region, temperate continental monsoon
- Typical black soil derived from loam loess
- Cropping system: continuous Wheat-corn- soybean rotation
- Treatment: CK, NP, NPM
- Time span: 1993-now

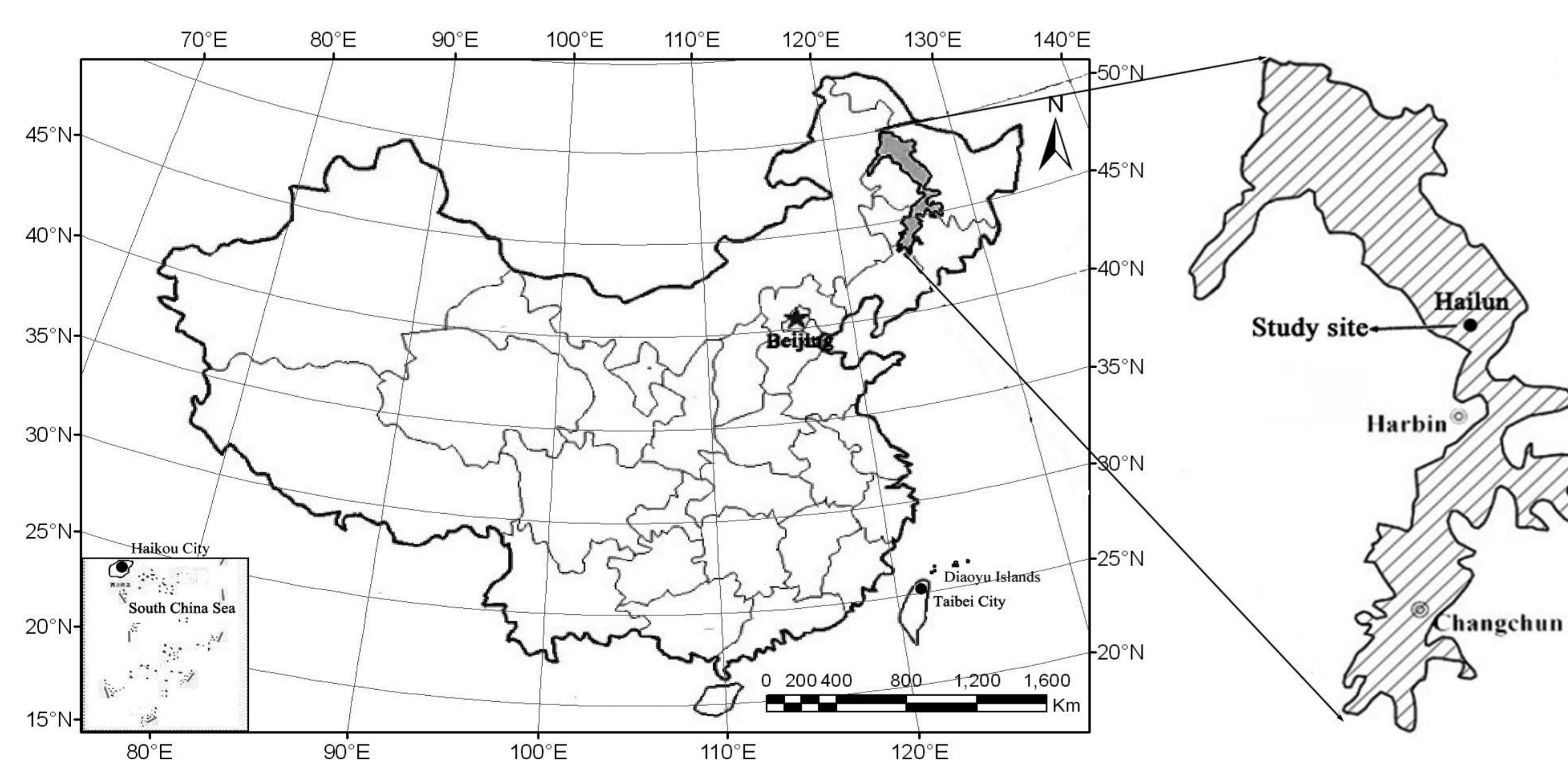


Fig.1 Study site



Fig.2 The profile of black soil

4. Results & Discussions

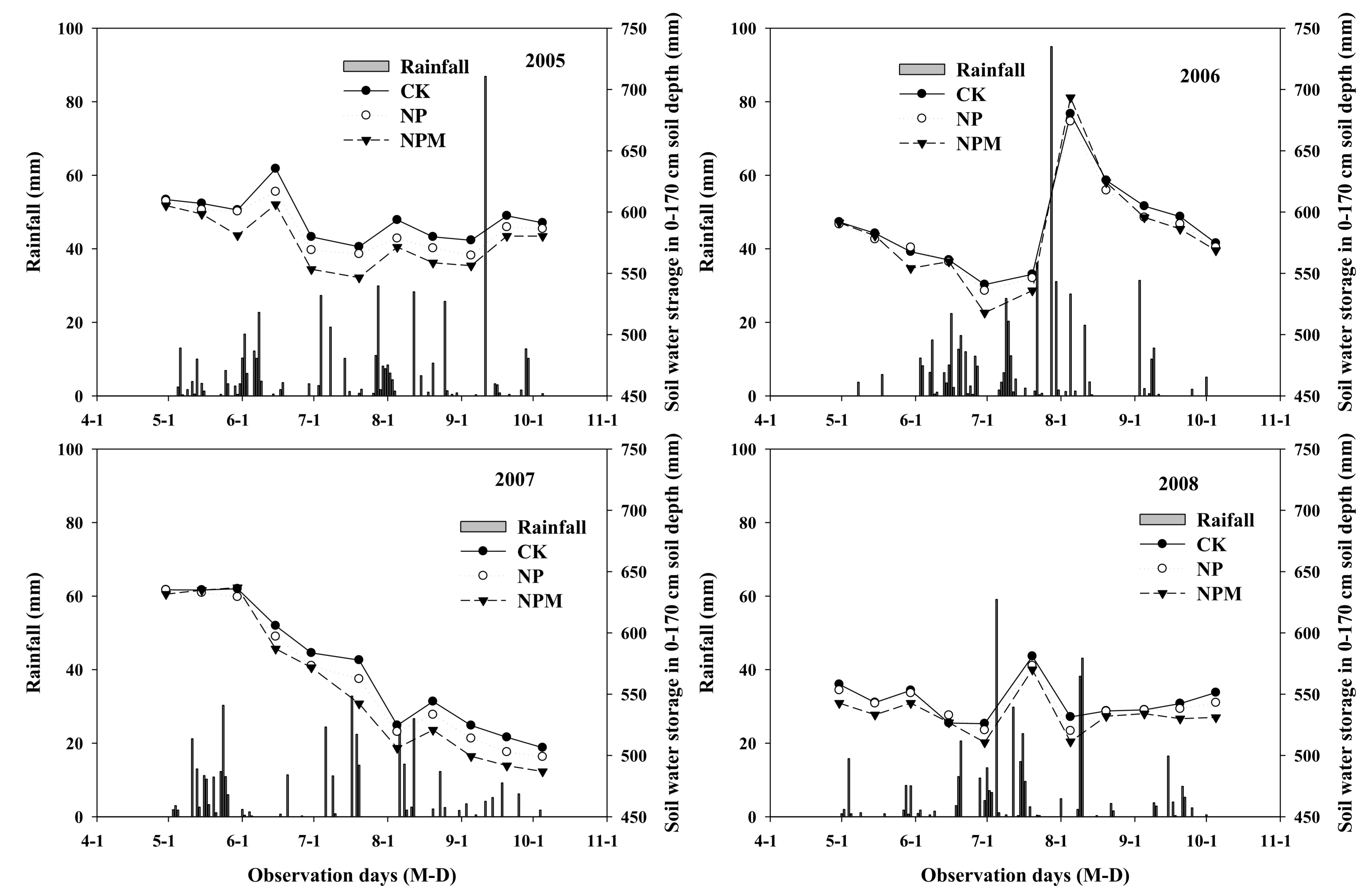


Fig. 3 The seasonal variation of soil water storage in 0-170 cm in experimental years

Tab. 1 Crop yield, water use efficiency (WUE), precipitation use efficiency (PUE) under CK, NP and NPM in experimental years

Year	Crop	Treatment	Crop yield (kg ha ⁻¹)	WUE (kg ha ⁻¹)	PUE (kg ha ⁻¹)
2005	Maize	CK	5860 ± 129 b	11.79 ± 0.26 b	12.16 ± 0.27 b
		NP	6837 ± 238 a	13.63 ± 0.48 a	14.30 ± 0.5 a
		NPM	7208 ± 385 a	14.31 ± 0.76 a	15.08 ± 0.8 a
2006	Soybean	CK	1026 ± 89 c	2.52 ± 0.22 c	2.56 ± 0.22 c
		NP	1346 ± 72 b	3.33 ± 0.18 b	3.36 ± 0.18 b
		NPM	2291 ± 122 a	5.89 ± 0.31 a	5.72 ± 0.31 a
2007	Maize	CK	6606 ± 106 b	12.95 ± 0.21b	17.33 ± 0.27 b
		NP	7378 ± 261 a	14.26 ± 0.51 b	19.36 ± 0.69 a
		NPM	7593 ± 276 a	14.44 ± 0.52 a	19.92 ± 0.72 a
2008	Soybean	CK	2106 ± 68 b	3.93 ± 0.13 b	4.06 ± 0.13 b
		NP	2186 ± 50 b	3.86 ± 0.16 b	4.21 ± 0.10 a
		NPM	2413 ± 88 a	4.46 ± 0.16 a	4.65 ± 0.17 a

5. Conclusions

For improving crop yield and increasing water use efficiency, the combination of chemical fertilizer and pig manure (NPM) is a viable management practice in Northeast China. Such a practice could improve soil water supply and reduce water deficit when seasonal drought occurs

6. Acknowledgement

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Annual average rainfall

540 mm

Annual average temperature

1.5°C

Frost-free period

120 days