Straw mulch acts as sustainable dryland wheat production to reduce environmental risk while increasing economic returns

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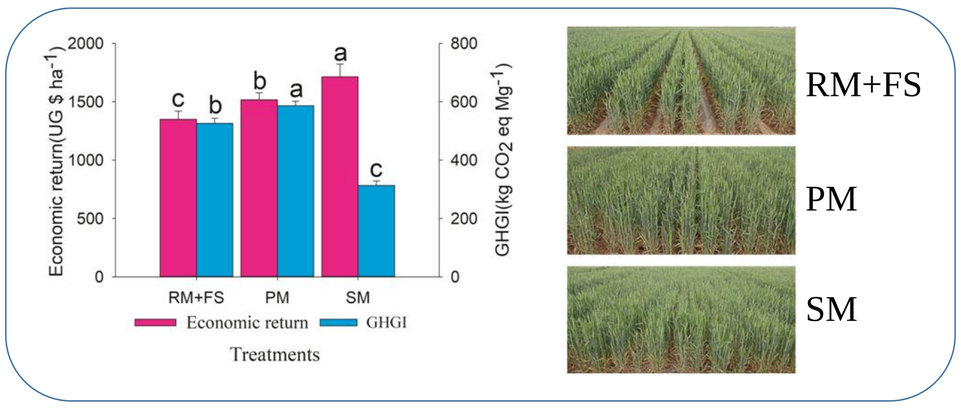
Graphical Abstract:



Key words:

Dryland; Straw mulching; Whole field plastic mulching plus bunch-seeding; Ridge plastic mulching plus furrow seeding; Winter wheat

Highlights

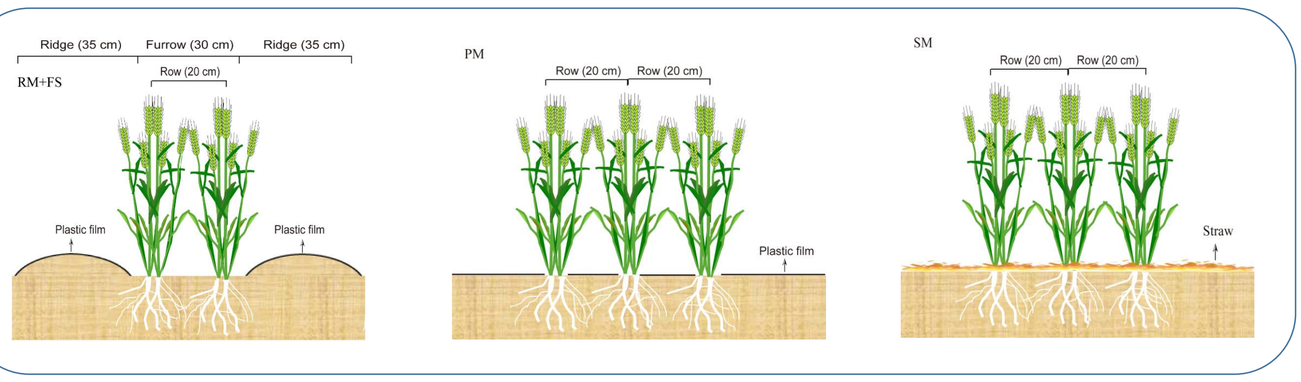
- **Straw mulching showed higher economic benefits than plastic mulching over five seasons.**
- **This finding was due to increased soil moisture storage and decreased GHG emissions.**
- **Straw mulching acts as sustainable dryland wheat production and well be superior to plastic mulching in dryland agriculture.**

Introduction

- **Dryland wheat as a monoculture was intensively planted on the Loess Plateau.**
- **Water stress is a key factor limiting dryland wheat production on the Loess Plateau.**
- **Plastics film mulching causes serious environmental pollution.**

Materials and Methods:

A diagram illustrating the three tested treatments:



Calculation equation:

soil water content prior to seeding or post-harvest (%) × soil depth increment (cm) × soil bulk density (g cm^{-3})/10
Nitrate - N (mg N kg^{-1}) × soil depth increment (cm) × soil bulk density (g cm^{-3})/10
GHG emission= $\sum_{i=1}^{n} AI_i$+Ef_i+E_{N_20}

Acknowledgements

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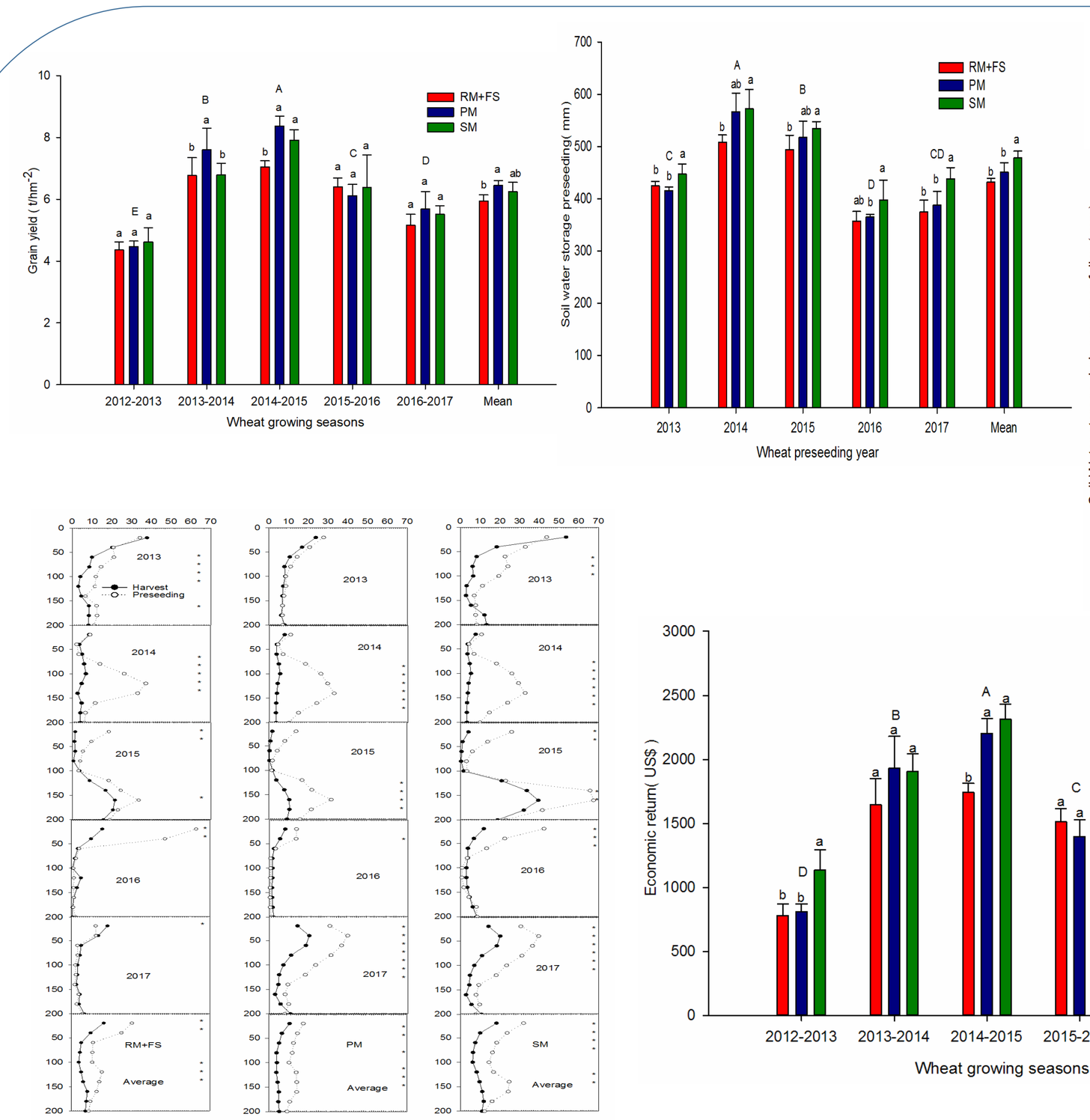
Results:



Nitrate distribution in the 0–200 cm soil layer post-harvest and prior to seeding

Conclusion:

Winter wheat straw mulch at a rate of 10 t ha^{-1} following a year-round mulching practice should be recommended to local farmers on the dryland areas and similar areas around the world.

Publication:

(1) Hubing Zhao, Jifei Liu, Xiuwen Chen, Zhaohui Wang, 2019. Straw mulch as an alternative to plastic film mulch: Positive evidence from dryland wheat production on the Loess Plateau. Science of the Total Environment, 676, 782–791.

(2) Xiuwen Chen, **Hubing Zhao***, Jifei Liu, Anran Mao.Winter wheat nitrogen utilization under different mulching practices on the Loess Plateau. Agronomy Journal. 2020, 112(2), 1391-1405.