

The impact of harvest year and farming methods on the nutritional value of wild barley (*Hordeum spontaneum*)

Harsimran Kaur¹, Luka Jvania¹, Carla S. Santos¹, Marta W. Vasconcelos¹
s-hkaur@ucp.pt; s-ljvania@ucp.pt; cssantos@ucp.pt; mvasconcelos@ucp.pt

¹ Universidade Católica Portuguesa, CBQF- Centre for Biotechnology and Fine Chemistry- Associate Laboratory, Escola Superior de Biotecnologia, Rua de Diogo Botelho 1327, 4169-005 Porto, Portugal

INTRODUCTION

Crop wild relatives (CWRs) are naturally occurring species closely related to cultivated crops, including their wild ancestors. Despite their potential to enhance crop and dietary diversity, they remain underutilized due to limited research on their nutritional value and practical applications.

Barley (*Hordeum vulgare* L.), domesticated from *Hordeum spontaneum* in Southwest Asia, is a key example, yet the nutritional quality of its wild ancestor remains underexplored.

OBJECTIVE

Analysis of the mineral composition and β -glucan content in the wild barley population.

METHODOLOGY

Samples were obtained from a long-term barley adaptation experiment where a wild-type/resynthesis line was introgressed into an elite line and grown under organic and conventional systems without artificial selection.

This study analyzes mineral and β -glucan composition in Population 1 (2001–2023) to assess the impact of farming practices on grain nutritional quality.

Mineral content was measured using ICP-OES, and β -glucan levels were determined with a mixed-linkage β -glucan assay kit (Motilva et al., 2017).

RESULTS

Mineral Composition

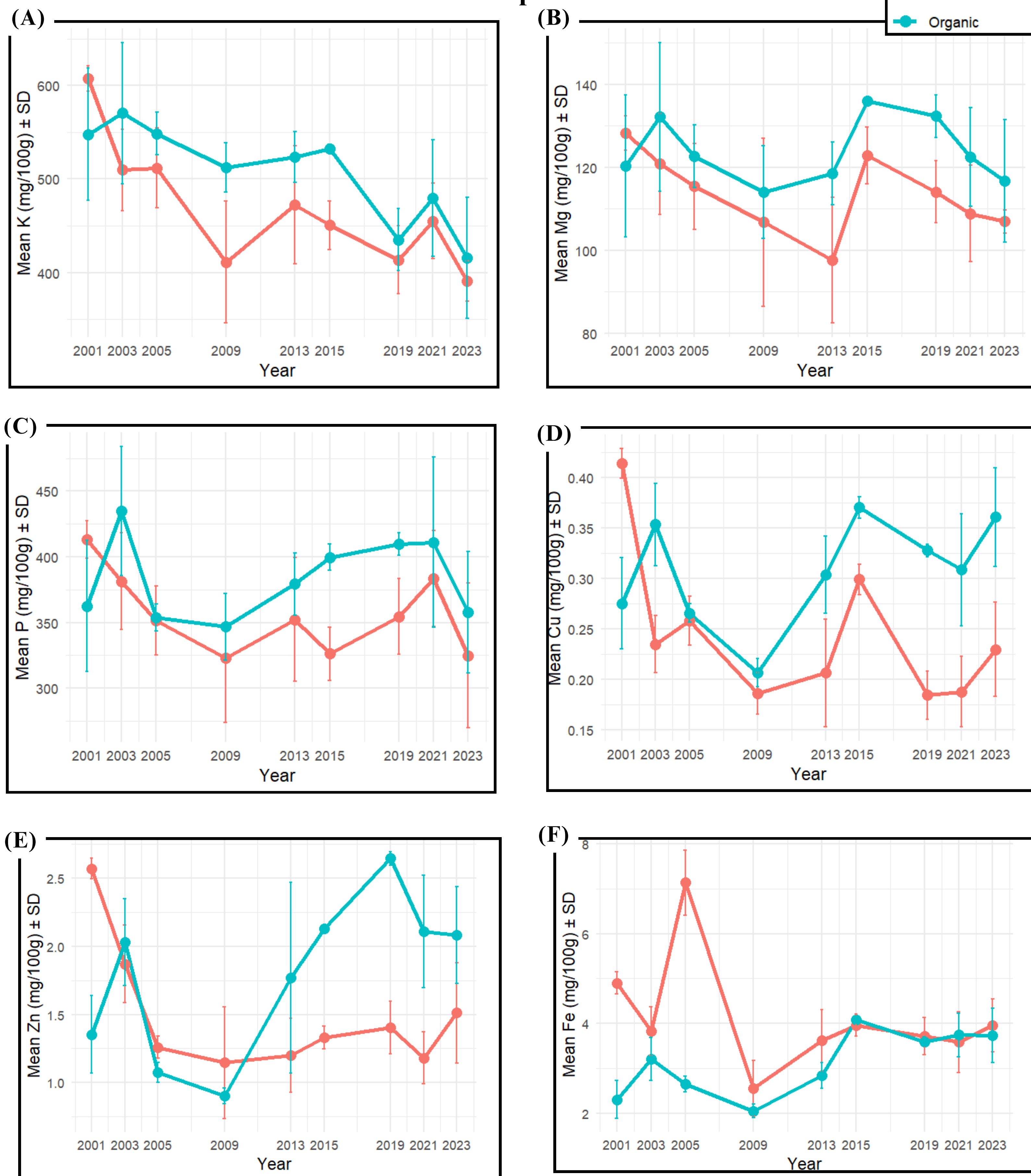


Fig. 1 Yearly mean mineral contents (mg/100g) \pm standard deviation of Potassium (A), Magnesium (B), Phosphorus (C), Copper (D), Zinc (E) and Iron (F) in wild barley under conventional and organic systems across nine harvest years (2001–2023). Points show annual means; error bars indicate standard deviation. The chart highlights interannual variation and trends between systems.

- Zn, Cu, P, Mg, and K were consistently higher in organic barley, while Fe was significantly higher in conventional barley, likely due to intensive use of fertilisers.
- Both global and year-specific effects indicate strong environmental influence on mineral content.

CONCLUSION

Results highlight the impact of farming practices and the environment on grain nutrition, pointing to the need for further research into optimized soil management and interactions with the environment in crop wild relatives.



REFERENCES

Ciolek, A., Makarska, E., Wesolowski, M. and Cierpiala, R., 2012. Content of selected nutrients in wheat, barley, and oat grain from organic and conventional farming. *Journal of Elementology*, 17(2).
Dempewolf, H., Baute, G., Anderson, J., Kilian, B., Smith, C. and Guarino, L., 2017. Past and future use of wild relatives in crop breeding. *Crop science*, 57(3), pp.1070-1082.
Motilva, M.J., Serra, A., Borrás, X., Romero, M.P., Domínguez, A., Labrador, A. and Peiró, L., 2014. Adaptation of the standard enzymatic protocol (Megazyme method) to microplaque format for β -(1, 3)(1, 4)-d-glucan determination in cereal-based samples with a wide range of β -glucan content. *Journal of Cereal Science*, 59(2), pp.224-227.

This research is funded by the COUSIN project, and the study is carried out at CBQF (Centre for Biotechnology and Fine Chemistry), Porto.

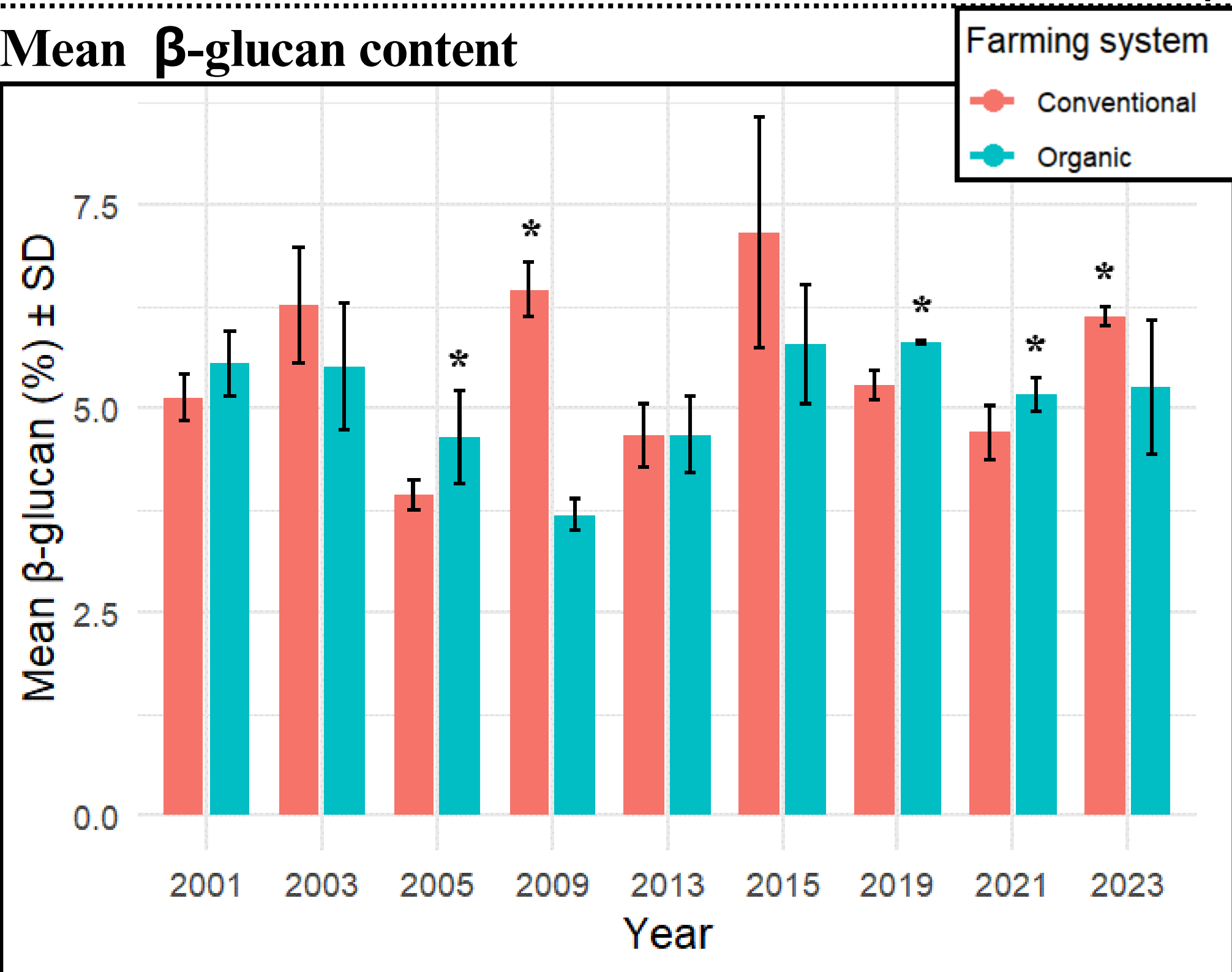


Fig. 2 Mean β -glucan content (%) \pm standard deviation in wild barley under conventional and organic systems across nine harvest years (2001–2023). Bars show annual means; error bars indicate standard deviation. Asterisks (*) mark years with significant differences, placed above the system with higher β -glucan content.

- No significant overall difference in β -glucan content between farming systems.
- Year-specific variations suggest farming practices may interact with temporal factors.